The Journal

OF THE

AMERICAN DENTAL ASSOCIATION

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INTRAVENOUS ANESTHESIA IN THE DENTAL OFFICE WITH SODIUM ETHYL (1-METHYL-BUTYL) THIOBARBITURIC ACID

By ADRIAN O. HUBBELL, B.S., D.D.S., Long Beach, Calif.

IN a previous article,[1] the use of intravenous sodium ethyl (1-methylbutyl) thiobarbituric acid (pentothal sodium) for dental surgery was discussed. The purpose of this paper is to offer suggestions to facilitate the use of this anesthetic agent in the dental office.

When pentothal sodium is administered intravenously by the intermittent injection technic of Lundy,[2] its action may be considered controllable. This method requires that the needle be left in the vein during the operation to allow the injection of small amounts of the anesthetic solution as indicated to maintain a satisfactory level of anesthesia. As commonly practiced, this method requires the services of two people, one to hold the syringe on the arm and the other to support the mandible and keep the posterior part of the mouth and pharynx free of blood and mucus. Assistance is usually available to the anesthetist in the hospital, but is seldom available in the dental office, being impractical because of limited space. With this anesthetic, it is particularly desirous that the anesthetist be at the patient's head to perform whatever duties may be necessary to maintain a free airway at all times.

The arm boards shown in Figure 1 were designed to be attached to the dental chair arm without the use of screws or bolts. They may be readily placed and they afford a firm support for the arm in the proper position for venipuncture. A small strap is placed around the board and over the hand to prevent pronation of the arm during anesthesia. (Fig. 2.)

Several devices [3, 4] have been designed to hold the syringe and thus leave the anesthetist free to be at the patient's head. Some of these are complicated and expensive. We have found that an ordinary chemistry clamp (Fig. 3) may be altered to clamp onto the arm board to provide a satisfactory support for the syringe.

The anesthetist's working tray (Fig. 4) is sterile and contains a sterile towel, one 10 cc. syringe, and two 20 cc. syringes. The small syringe contains 6 cc.

of 2.5 per cent solution (150 mg.) of pentothal sodium and has attached a 20-gage 1.5 inch intravenous needle. Each large syringe contains 20 cc. of 2.5 per cent solution (500 mg.) of pentothal sodium. To one of the large syringes is attached 8 inches of light gum rubber tubing with connectors. When the flexible tubing is used, the needle is less likely to be displaced from the vein during anesthesia than when the syringe is held on the arm. The plunger of the large syringe may be retracted and blood aspirated into the tubing to demonstrate the position of the needle in the vein.

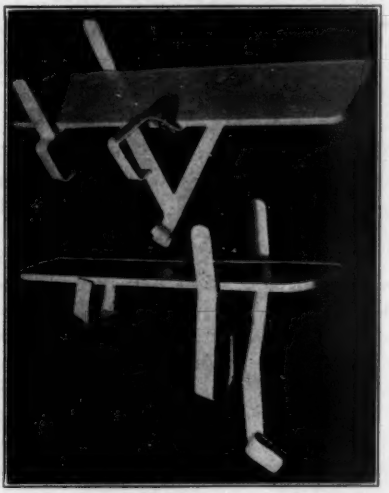

Fig. 1.—Arm boards for two types of dental chairs.

The anesthetist's emergency tray (Fig. 5) contains (A) a glass tube containing ampules of picrotoxin, coramine, epinephrine and caffeine-sodio-benzoate; (B) a glass tube containing a sterile syringe and needle for use with the ampules in the tube (A); (C) a glass tube containing a sterile syringe with a one-two-hundredth grain tablet of atropine sulfate and an ampule of sterile water for mixing; (D) two No. 14 French catheters; (E) white petrolatum for lubricating catheters; (F) a laryngoscope, and (G) endotracheal catheters.

The prone position should be used for the administration of general anesthetics whenever possible. However, this position is impractical in most dental offices, and we have observed no contra-indications to the reclining chair position. The chair should be adjusted to a deep reclining position and tilted to prevent the patient from sliding down in the chair as relaxation occurs. The headrest is placed under the occiput to tilt the head slightly forward, a position in which the

Fig. 2.—Arm in position on arm board with restraining strap wrapped around board, wrist and hand.

Fig. 3.—Modified chemistry clamp which may be attached to arm board to support syringe. The clamp should be ground at point A to form a ledge level with point B.

removal of blood and mucus from the mouth is greatly facilitated. A good aspirator is indispensable when an intravenous anesthetic is used, because the cough reflex is quite active and small amounts of blood or saliva in the laryngopharynx may cause persistent coughing. The usual saliva ejector is entirely

inadequate for the removal of the thick mucus so frequently encountered.

We prefer to withhold premedication for an anesthesia of fifteen minutes or less. For longer anesthesia, particularly for cavity preparation, pentobarbital sodium grains ¾ to 1½ is given one hour before the operation. The amount of pentothal sodium required to maintain anesthesia and the flow of saliva is markedly reduced when this premedication is used, but the recovery period is prolonged.

The patient's arm is placed on the arm board and the hand strap is applied. The cubital region is prepared for venipuncture with tincture of metaphen 1 : 500 or alcohol. A sterile towel is placed over the lower portion of the forearm, extending above the lower border of the prepared part of the arm. A tourniquet of heavy penrose drain is placed and the patient is asked to make a tight fist. Venipuncture is made, with the 10 cc. syringe. The syringe provides a handle for the needle and allows easy aspiration to demonstrate the position of the needle as it enters the vein by the immediate show of blood in the syringe.

The induction of anesthesia is started, the mouth prop is inserted and the patient is asked to count aloud. As the induction slowly progresses, the large syringe is placed in the clamp, and be-

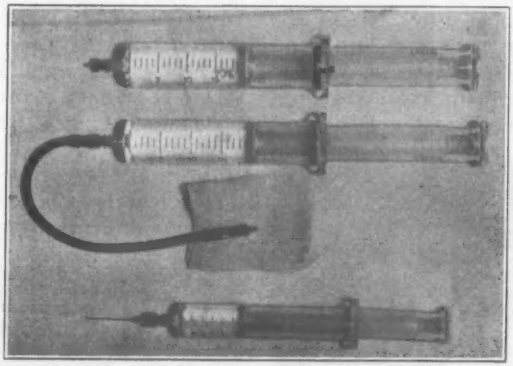

Fig. 4.—Anesthetist's working tray containing syringes of pentothal sodium solution, tubing and needle.

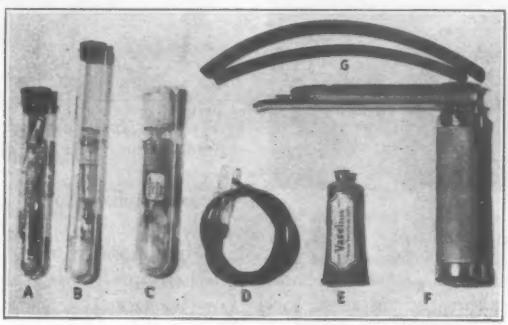

Fig. 5.—Anesthetist's emergency tray.

fore the operation is begun, the small syringe is removed from the needle and the tubing of the large syringe is connected. The hub of the needle is fixed to the arm with adhesive tape. (Fig. 6.)

When induction is complete, the mouth pack is placed and the operation may be begun. Lyon has suggested the use of sea sponges for mouth packs, and we have found them to be very effective in the absorption of saliva, mucus and blood. A sponge 3 to 4 inches in diameter is compressed and placed in the mouth. By a constant expanding pressure, the sponge closes the mouth off

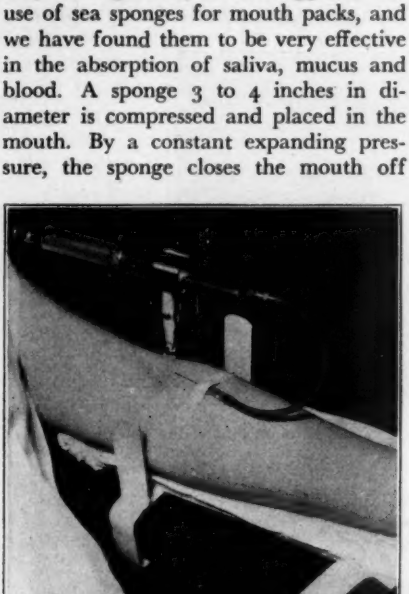

Fig. 6.—Clamp supporting syringe as employed during anesthesia.

from the pharynx and gives maximum protection against the inspiration of foreign material. After use, the sponges are washed in cold water and placed in compound solution of cresol or aqueous merthiolate 1 : 1,000 for fifteen minutes.

Pentothal sodium should be administered only by an anesthetist trained in its use. The dangers of this anesthetic agent are chiefly concerned with respiratory depression and obstruction of the airway. Respiratory depression is seldom acute in dental anesthesia. For operations requiring more than a few minutes, we prefer to use oxygen at a rate of 3 liters per minute administered through a French catheter passed into the pharynx through the nose. (Fig. 7.) Partial or complete respiratory obstruction is frequently encountered as a result of the accumulation of saliva, thick mucus or blood in the laryngopharynx. The aspiration of this material from the laryngopharynx is usually all that is necessary, but the laryngoscope, endotracheal catheters and French catheters should be on hand to remove any foreign material that may have entered the trachea.

In a small percentage of patients, the airway may become suddenly and completely obstructed by a spasm of the

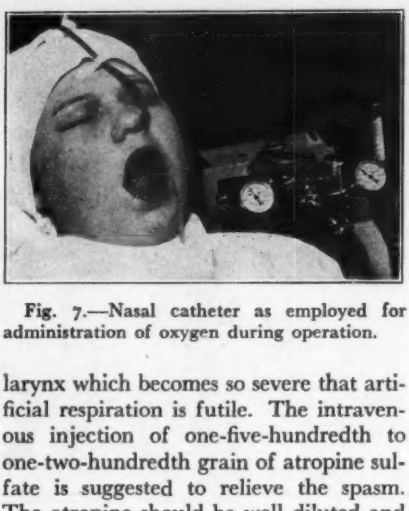

Fig. 7.—Nasal catheter as employed for administration of oxygen during operation.

larynx which becomes so severe that artificial respiration is futile. The intravenous injection of one-five-hundredth to one-two-hundredth grain of atropine sulfate is suggested to relieve the spasm. The atropine should be well diluted and injected slowly. It should be discontinued as soon as relaxation of the spasm occurs. The throat should be cleared to eliminate the danger of inspiring foreign material and oxygen should be given to quickly relieve anoxemia.

A partial spasm of the larynx is more frequently encountered than a complete laryngospasm. Partial spasms appear to result from the presence of mucus or

blood in the laryngopharynx, as they are usually accompanied by coughing and are characterized by stridulous breath sounds and insufficient respiratory exchange. This condition is relieved by clearing the throat and administering oxygen.

The preparation of intravenous solutions must be carried out with extreme care, to avoid possible serious infections. The mixing of pentothal sodium with sterile water should be carried out on a sterile table or tray after thorough preparation of the hands. Sufficient pentothal sodium solution may be mixed at one time to last several days and thus avoid the dangerous practice of hastily mixing one ampule of the drug just prior to administration. Solutions that are to be kept for future use should be protected from light and air. Extra syringes may be filled and wrapped in sterile towels until needed. A gummy residue collects on the plunger of the syringe at the mouth of the barrel in about eight hours and, to avoid sticking, may be removed with an alcohol sponge before the syringe is used. Sterile water can be purchased in 50 cc. brown glass bottles which, when empty, make convenient storage bottles for extra solution. When the stored pentothal sodium solution is needed, the rubber cap is sterilized with alcohol and the needle is passed through the cap to withdraw the required amount of solution without contamination. Solutions may be stored for a week without loss of potency when properly protected from light and air.

Dilute solutions of pentothal sodium are recommended because they are less irritating to the vein, and the 2.5 per cent solution should be used whenever possible. When the solution is injected into a vein, the blood serves to further dilute the drug, and the rate of injection should be proportionately slower for small veins than for large veins.

Occasionally, a vein that has been used for injection will become hard and tender to pressure, and it may be palpable several inches above the venipuncture site. This reaction, which becomes evident on the second or third day, is thought to be due to chemical irritation by the anesthetic solution. These inflamed veins do not exhibit the severe symptoms of an infectious phlebitis.

The recovery period following anesthesia with pentothal sodium without premedication averages very nearly the same as that required for nitrous oxide-oxygen anesthesia. Bullard[5] has suggested coffee as an aid to recovery and we have found it to be helpful. Anesthesia of one hour or more, as might be required for cavity preparation, requires a prolonged recovery period, which in some patients may be shortened markedly by the intravenous administration of from 0.003 to 0.005 gm. of picrotoxin (Lilly) immediately after the operation.

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308 Security Building.

VITALITY TESTS WITH PARTICULAR REFERENCE TO THE USE OF ICE

By Louie T. Austin, D.D.S., and Donald T. Waggener, D.D.S., Rochester, Minn.

DIAGNOSIS in dental practice is based on the history of the case and on observations made during examination. A clinical examination is made of the patient's mouth. Much information can be obtained by roentgenographic examination, by transillumination and by taking a history. These are aids in diagnosis, and any procedure that furnishes information is worthy of consideration.

In any complete examination in a case of suspected infection of the mouth, the vitality of the teeth should be determined.

Generally, one's evaluation of a certain tooth is based on a number of different examinations. In the search for dental foci, a tooth may appear to be normal on roentgenologic examination, and may be comfortable, well restored and useful in every respect, yet the pulp may be nonvital.

In a differential diagnosis, the vitality of the involved teeth should be ascertained. In the case of facial pain, one of the first factors to be ruled out is disease of the teeth.[1] In differentiating between the early radiolucent stages of cementoma and of granuloma, establishment of the vitality of the teeth involved is of utmost importance. Before operating for any large cyst, the vitality of the teeth seemingly involved, as shown in the roentgenogram, must be determined. When vital responses are obtained from teeth the roots of which are embedded in benign tumor masses of the hard structures of the mouth, the removal of such teeth should be discouraged.

The extent of involvement of the teeth in diseases of the bony structures of the mouth, especially in osteomyelitis, can best be determined by vitality tests.

Following traumatic injuries of the face, vitality tests and roentgenograms are necessary to determine the extent of injury. It is advisable to determine the vitality of the involved teeth again after several months have elapsed. Certainly before filling a tooth containing deep seated decay or before attaching a bridge or partial denture to any tooth, assurance of the vitality of the involved teeth is important.

In a routine examination, if teeth contain deep fillings, which in time may be the cause of repeated thermal shock, pulpitis should be suspected until a normal response to vitality tests is obtained.

Before removal of any impacted tooth that might be causing pressure on an adjoining erupted tooth, the vitality of the latter should be determined. In maxillary sinusitis, one of the first suspected dental sources is a diseased upper posterior tooth. Ordinarily, nonvital teeth will show some discoloration, but at times even this is absent. Therefore, there are a number of conditions in which a knowledge that the teeth are vital plays a most important part in diagnosis, prognosis and the method of treatment. We have mentioned the roentgenogram as an aid in determining the vitality of many teeth, but further confirmation often is required, especially in the early

From the Section on Dental Surgery, Mayo Clinic, Mayo Foundation.

stages of disease of the pulp. For this reason, it is important that some reasonably dependable method be employed to determine the vitality of teeth.

Changes in the dental pulp are difficult to diagnose. Since the pulp is enclosed in a hard, unyielding chamber, examination cannot be made directly; therefore, one must depend upon the application of various stimuli for certain diagnostic reactions in the dental pulp.

Bunting says that sensation in the dental pulp probably is produced in two ways. It may be produced by thermal, chemical, traumatic or electric irritation of the dentinal fibrils which convey the impulse to the fibril cells on the periphery of the pulp, and which in turn convey the impulse to the sensory nerve endings in the immediate vicinity; or disturbance of the vasomotor function of the pulp may cause interstitial pressure, which directly affects the sensory nerve endings. Although it is difficult to tell how sensation is produced in a given case, it is probable that some form of hyperemia or other vascular disturbance occurs when the pulp is irritated or receives any thermal stimulus.

The dental pulp and dentin have no sensory function other than that of pain[1, 2-6, 9-12]; therefore, their response to stimuli and injury is pain of varying degree.

Involvement of the pulp in odontitis occurs very much earlier than is indicated clinically. The odontoblasts are a part of the dental pulp and their processes extend into the dentinal tubules. As soon as these processes receive a stimulus or an injury, response in the pulp occurs.[4] It has long been known that application of a hot or cold substance to a normal tooth causes discomfort. Jack, in 1899, referred to the sensitiveness of teeth to thermal changes. Black, in 1915, created hyperemia of the pulp by testing for vitality with hot guttapercha.

The momentary application of hot or cold substances to the surface of a tooth usually causes an acute arterial hyperemia. However, if the hyperemia is mild, it is painless, but if it is more severe, it causes pressure on the sensory nerve endings of the pulp and thus causes pain. If the pulp is normal and not diseased, the pain disappears immediately on removal of the stimulus. This indicates a physiologic response to the stimulus and establishes the fact that the pulp is probably normal. If the pain persists and only disappears gradually, disease of the pulp must be suspected. Pulp, already hyperemic, responds more readily to thermal stimuli because of the distention of the vessels already present and which causes an increase in tension.

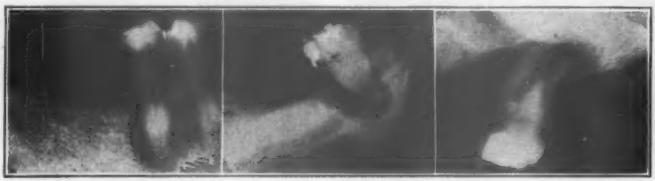

Fig. 1.—Involvement of root ends of teeth by extension of pyorrhea pocket.

Active and passive hyperemia usually can be differentiated by the response to thermal stimuli. In the early stages of involvement of the pulp, that is before it has become congested, the application of either hot or cold causes pain.[5] Disappearance of the pain immediately after removal of the stimulus indicates an active hyperemia. If the pain disappears slowly, passive hyperemia is in-

dicated. In congestion of the pulp, application of heat causes persistent pain because of extreme distention of the vessels. However, application of cold affords some relief. After the pulp becomes purulent, the application of heat continues to cause pain because of the attempted expansion of the enclosed gases, which results in increased pressure in the pulp. Application of a cold substance will relieve this pain.

Pulp tests often indicate only that the nerves of the pulp respond to stimuli. This may occur either in a healthy normal pulp or in a diseased pulp. A dental pulp may be normal and vital; it may be diseased, but still vital; a portion of the pulp may be vital and a portion nonvital, or the pulp may be entirely nonvital; but as long as metabolism continues in the dental pulp, it is customary to speak of that pulp as vital. However, as in many other organs of the body, metabolism may continue even though the pulp is diseased. Frequently, teeth must be condemned even though they respond to ice and other tests. (Fig. 1.) If the root end of a tooth is involved by infection which has extended from a pyorrhea pocket rather than from the pulp of the tooth, it may respond to all types of vitality tests. This indicates the possibility that the vessels and nerves supplying the tooth remain intact for varying lengths of time and even after infection has involved the root end.

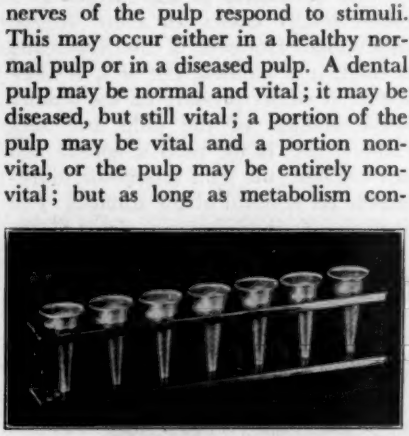

Fig. 2.—Containers in place in rack.

For the testing of dental pulp in the routine examination of the teeth for infection, the use of ice, combined with the use of roentgenograms, seems to many dentists to be the method of choice.

The application of the usual ice cube, or of a piece of chipped ice, to teeth in the posterior part of the mouth, to irregular teeth or to small teeth sometimes proves difficult. To facilitate the application of ice to these teeth, we have designed special cone-shaped containers (Fig. 2) in which to freeze water in a refrigerator. These containers are made of an aluminum blank turned down to proper size on a lathe. Each container is 3 inches high and 1½ inches wide at the base. The containers are held base-end up in a rack, which may be made in different sizes to fit the freezing compartment of any refrigerator. Ice frozen in one of these containers is easily removed by inverting the container and holding it in a stream of tap water for a few seconds. The ice then obtained has the shape of a cone. The base of the cone is large enough to be gripped firmly when held in a towel. (Fig. 3.) The other end of the cone, being pointed, is easy to apply to any exposed surface of a tooth.

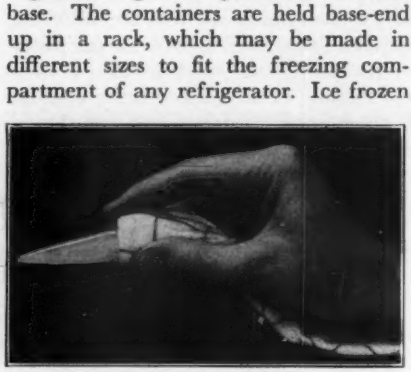

Fig. 3.—Manner of holding ice cone in towel ready for use.

Ice has several advantages over other means of testing the pulp. 1. Shaped as a cone, it is convenient to handle. If held firmly in a towel or napkin, it neither tends to slip nor becomes unpleasantly wet during a prolonged vitality test of all the teeth. 2. Ice shaped

like a cone is easy to apply to any of the teeth, even those in the posterior part of the mouth. 3. Ice is a substance known to all patients; therefore, its application to the teeth does not cause nervousness or anxiety. After one good response to an electric stimulus, it is sometimes difficult to interpret the reaction of a patient because of his apprehension. Some patients refuse to have the teeth tested with electricity, but readily submit to an ice test. 4. Ice is probably the most useful of all means of examination of the teeth of children. A child is apt to give a false response to electric tests after the first response. 5. Ice is valuable in testing crowned teeth or those that contain large fillings. It is unnecessary to cut holes in an artificial crown to apply ice, as is usually necessary when electric tests are used. 6. When ice is used, less time is consumed during the test. 7. It is not necessary to dry the teeth or make other preparations. 8. The use of ice eliminates the need of a variable, as the temperature of ice is always the same on the melting surface.

Fig. 4.—Recession of pulp and formation of secondary dentin in first bicuspid.

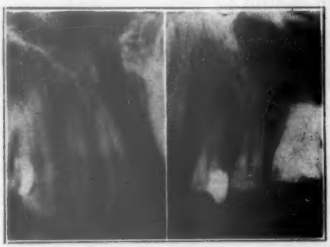

Fig. 5.—Necrotic pulps of upper lateral incisor and upper first bicuspid with infection of tissues surrounding root ends.

At the beginning of the test, one should determine how the teeth respond by touching the tip of the ice cone to the labial surface of one of the anterior teeth. Usually, an anterior tooth responds quickly. In the case of bicuspids and molars, application of the ice to the tooth should be made just gingivally to the greatest diameter of the tooth. One always should compare the response of one tooth with the response of the corresponding tooth on the opposite side of the arch. Occasionally, if one tooth does not respond to the test, a response may be obtained by repeating the test after the other teeth have been tested.

From time to time, none of the teeth respond to the application of ice. On inquiry, it is usually learned that the patient is in the habit of drinking much ice water, or eating much ice cream or lives in the far north and inhales very cold air. The teeth of such patients seem to have acquired a tolerance to cold and the application of ice to the teeth, even for several minutes, may have no response.

Since the only sensation from the dental pulp or dentin is that of pain, and since any response differs from another response only in the degree of pain, mistakes will be avoided in interpretation by asking the patient to say when the tooth becomes uncomfortable rather than when it hurts or is painful. Individuals interpret pain differently. What may seem a severe pain to one patient may seem only a slight pain to another. However, any change from normal caused by the application of ice during a vitality test will have a response that most people will interpret as an uncomfortable sensation.

The time necessary for the response to

ice may vary because of (1) the amount of recession of the pulp; the less ready response of the first bicuspid to vitality tests than that from the second bicuspid, because of recession of the pulp (Fig. 4); (2) the amount of secondary dentin formed; (3) the presence or absence of metallic fillings, crowns or erosion or abrasion of the surfaces of the teeth; (4) the presence or absence of pulpitis, and (5) the individual differences on the part of patients. The time necessary for the uncomfortable sensation to disappear is an indication of the condition of the pulp. If it disappears promptly on removal of the ice, the pulp is probably normal.[6] If the uncomfortable sensation gradually disappears, disease of the pulp should be suspected and the tooth should be tested by other methods. Failure of the tooth to respond only to the application of ice does not mean necessarily that the pulp is dead, provided there are no clinical symptoms, and roentgenographic examination and other tests do not indicate that the pulp is dead.

We have used ice routinely for testing pulps at the Mayo Clinic for about three years. Electric apparatus of the high frequency and low frequency types also is available. However, because it is easy to use, can be employed quickly and does not cause much discomfort, ice is used almost exclusively for routine testing. When, as occasionally happens, a tooth fails to respond to ice for no apparent reason, some type of electric test should be employed. Usually, a tooth that is not infected, but fails to respond to the application of ice, will respond readily to the high frequency electric current. This is particularly true in those cases in which there has been much recession of the pulp, with secondary formation of dentin, and in those cases in which tolerance to cold may have resulted from drinking many cold drinks, chewing ice or living in a cold climate for a considerable time. However, not every person exposed to cold acquires this tolerance.

In comparing the results obtained by various tests used on the same tooth, we have found that application of ice does not have a response in a tooth in which the electric test fails to elicit a response. However, occasionally, electric tests, particularly those in which a low frequency current is used, will have a vital response when ice will not. In some cases, this difference in response may be the result of recession of the pulp or tolerance to cold, but it also occurs in cases in which roentgenographic examination and examination of the pulp following extraction disclose that the pulp is infected. Application of ice does not have such a "false" vital response; therefore, we believe that it has fewer false responses than does the electric test. Even the high frequency electric apparatus permits a 60-cycle current to pass through the pulp, and this may have a response as a result of direct electric stimulation or shock of vital tissues surrounding the tooth when the necrotic pulp has become liquefied, which permits a current to pass through it. Both the upper lateral incisor and the upper first bicuspid in Figure 5 were negative to ice application, but positive to both the high and low frequency currents.

SUMMARY

To make a complete examination of the mouth for infection, the vitality of the teeth must be determined. Application of ice as a test for vitality of the pulp is most valuable. Ice may be used conveniently when frozen in the form of cones. It is the agent of choice for routine testing of the pulp because it is easy to apply to the teeth; its use causes no apprehension on the part of the patient, being especially useful if the patient is a child; no preparation of the teeth is necessary; its use is less time-consuming than other methods, and it has fewer false responses and causes less

unpleasantness from the standpoint of the patient, and the temperature of the ice is always the same; which eliminates any variable factor.

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INFECTIONS ABOUT THE HEAD AND NECK WITH PARTICULAR REFERENCE TO THOSE ABOUT THE ORAL CAVITY

By DONALD M. GLOVER, M.D., Cleveland, Ohio

THE commonest infections about the head and neck are ordinary boils, or furuncles. They may occur anywhere on the skin surface of the body, usually arising about hair follicles. Those occurring on the cheek, and especially the upper lip, are more than ordinarily hazardous. The angular vein on each side of the nose carries blood into the cavernous sinus at the base of the brain, after traversing the orbit through the superior orbital vein, and bacteria transported via this route may be a source of fatal sinus thrombosis or septicemia. These presumably simple and harmless boils are treated by almost every housewife with her favorite remedy, and most of them get well in spite of onion poultices, proddings with a sewing needle and violent squeezing to get the "core" out prematurely.

The furuncle will ordinarily run a fairly consistent and simple course if treated kindly by bed rest, hot applications and judicious letting alone. The pustule that crowns the furuncle within a day or two of its inception sometimes leads the patient or his physician to incise in search of pus. Incision at this stage, before the infection is localized, merely spreads bacteria into the surrounding tissues, or lymphatics or even the blood stream, occasionally with disastrous results. Squeezing the boil is even more dangerous.

We occasionally see a small pimple of

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the lip that has been prematurely incised by the physician, with the result that the patient is desperately ill, with brawny red swelling of the entire upper lip and cheek and one or both eyes swollen shut. The time then has arrived for application of the classical principles of rest, heat and prayer. Such secondary lymphangitis and cellulitis may eventually localize in one or more abscesses requiring surgical drainage, or the process may extend and the patient may succumb with sinus thrombosis and septicemia.

Most superficial infections go through

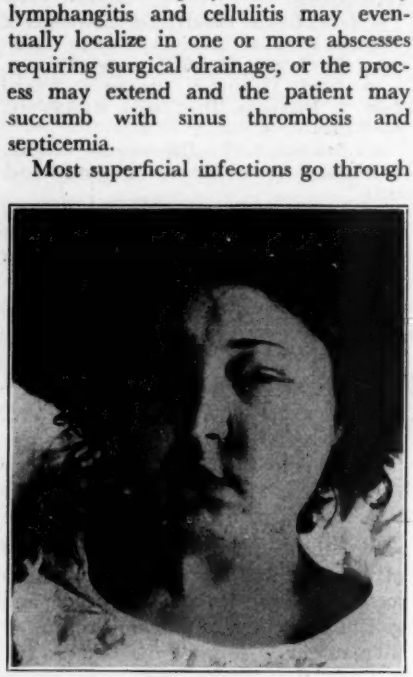

Fig. 1.—Severe spreading cellulitis of cheek and septicemia, following extraction of infected molar.

a fairly orderly process of localization if given a chance. The cells that contain immune bodies build an inflammatory wall about the invading organisms and the dead products of their destructive attack. When the process of localization is complete, the epidermis or mucous membrane over it breaks down from pressure and the contents are discharged. Within a day or two, the central slough, or "core," may separate and work out spontaneously or may be gently lifted out with sterile forceps. Within a few days more, the wound granulates and heals. This process of localization is best aided by complete rest of the affected part (movement disseminates infection), local applications of heat and general measures which improve resistance and immunity. Chemotherapy with sulfanilamide, sulfapyridine, or sulfathiazole is sometimes helpful, but I am certain that its benefits are less important than the simple principles of rest, heat and avoidance of surgical trauma. X-ray irradiation of the infected area has been recommended as an aid to regression or localization of the lesion, but its effects are inconstant and sometimes disappointing.

The carbuncle, which is in effect a

Fig. 2.—Massive sequestrum involving most of body of mandible.

glorified boil, has a predilection for the back of the neck, but occasionally occurs on the face. The principles of treatment are much the same as those already set forth except that carbuncles almost always require surgical drainage because of the amount of tissue destruction resulting from pressure from the large area of infection.

Of the next type of infection to which I wish to draw attention, I speak with humility, because it is one that is probably more familiar to all of you than it is to me. The fact that all too frequently I see disasters resulting from mishandling by some one in your profession or mine prompts me to present the matter for

your consideration. The following case histories will help to illustrate the problem.

REPORT OF CASES

CASE 1.—A woman, aged 37, was admitted to the hospital desperately ill with tense swelling of the left cheek. Her left eye was swollen shut and her temperature was 40° C. Three days before, she had consulted her dentist because of a small painful swelling about the left lower jaw and cheek. Following extraction of an infected molar, the swelling increased greatly. A blood culture showed the hemolytic streptococcus. The patient was treated with continuous hot compresses and large doses of sulfanilamide, but died on the third day after admission. (Fig. 1.)

Fig. 3.—Patient after removal of sequestrum. (Compare Figure 2.)

CASE 2.—A man, aged 28, whose teeth had been in bad condition for years, with marked pyorrhea, developed a painful swelling about the right mandible in the molar region. An obviously infected molar was extracted. The swelling extended to the cheek. After a week of conservative therapy, several additional teeth were extracted. The patient was admitted to the hospital with a high fever and enormous swelling of the entire right side of the face, extending down the right side of the neck. After several days of bed rest, chemotherapy with sulfanilamide and hot applications, the swelling at the angle of the jaw became fluctuant and was drained by incision. In the meantime, there was profuse foul drainage into the mouth from the sockets of the extracted teeth. Subsequently, another area became fluctuant beneath the body of the mandible and this was likewise drained.

During all of this time, the patient was desperately ill, and it became apparent that the right half of the mandible was undergoing necrosis. The subsequent course was enlivened by several severe hemorrhages requiring packing and repeated transfusion and finally ligation of the external maxillary artery, which had beeen eroded.

Fig. 4.—Spreading cellulitis of cheek and subtemporal abscess from infected molar.

Finally, after months in the hospital, enough involucrum had formed about the huge sequestrum, which included most of the right half of the mandible, that it could be safely removed surgically. At the end of a year, the patient was convalescent, but with a badly deformed jaw and some dead bone still to come away. (Figs. 2 and 3.)

CASE 3.—A man, aged 30, developed a swelling on the right side of the jaw. An obviously infected right lower third molar was extracted. The swelling extended to the eyelids and the cheek became tense. An incision was made in the cheek, but only edematous fluid was obtained. The patient was hospitalized, where he was desperately

ill, with a high fever. After several days of sulfanilamide therapy and application of hot compresses, an orbital abscess was drained. The swelling continued to extend in the temporal area until the entire right side of the scalp was tense and edematous. (Fig. 4.) In the meantime, copious quantities of foul pus drained into the mouth from the alveolar process of the mandible. A large subtemporal abscess was finally drained through the scalp and counter-drained at the angle of the mandible. The entire ramus and posterior part of the body of the mandible were now undergoing necrosis. After six months, enough involucrum had formed so that the huge sequestrum, which included all of the ramus and angle, could be safely removed. (Figs. 5 and 6.)

CASE 4.—A girl, aged 7, developed a painful swelling in the left cheek at the angle of the mandible. An infected molar was suspected and was extracted. The swelling was greater the next day, and an adjacent tooth was removed. The following day the swelling had extended upward to close the eyelids, and down to the neck. The temperature was 40° C., and the patient had a convulsion. The blood culture was negative. After several days of hot compresses and chemotherapy, the jaw began to drain copiously into the mouth, and an abscess localized at the angle of the jaw, which was drained surgically. At the end of six months, there was an unsightly scar at the angle of the mandible, which drained periodically, with a sinus draining into the mouth and a sequestrum near the angle of the mandible.

Fig. 5.—Sequestration of most of ramus of mandible three months later. (Case shown in Figure 4.)

CASE 5.—A boy, aged 10, awoke with swelling in the upper lip and cheek. An upper lateral incisor which had been injured some months previously was suspected as the source of trouble and was extracted. When the swelling increased the following day, closing the eye, the sulcus of the upper lip was incised, but nothing was obtained. After several days of bed rest, hot compresses and sulfanilamide, the area of infection localized and drained out through the socket of the infected tooth. Convalescence was without further incident. (Fig. 7.)

CASE 6.—A physician had been bothered by a lower third molar periodically. One day, swelling developed in the region, and he persuaded his dentist to extract the offending tooth, probably somewhat against the better judgment of the latter. Two days later, swelling developed in the floor of the mouth. The following day, the patient was in the hospital with a full-blown case of Ludwig's angina, with the tongue swollen up to the roof of the mouth, tense swelling beneath the mandible, inability to swallow and a high fever. After two days' treatment with hot compresses, the abscess in the floor

Fig. 6.—After removal of sequestra, six months after original infection. (Compare Figures 4-5.)

of the mouth was drained from below (probably before localization was complete) and, within six hours, the patient was having so much difficulty in breathing, due to edema of the larynx, that a tracheotomy was performed. The patient recovered after a stormy illness.

Many similar cases could be cited, some almost identical with those described. In most instances, the patient recovered, but several died. The bacterial flora was a varied one, usually mixed. There were, however, certain features in common which permit generalization.

Fig. 7.—Cellulitis of cheek following infection about upper lateral incisor.

Fig. 8.—Swelling of cheek produced by acute septic parotitis.

In all of the cases cited, cellulitis of the cheek was present when extraction was performed, and the infection extended after the extraction. In several instances, incisions were made into edematous tissue. In other instances, abscesses were drained before walling off was complete.

We are gradually revising our ideas about surgical drainage in acute infections. Time was when evidence of infection anywhere in the body was the signal for immediate surgical drainage. It has become apparent, however, that to add surgical trauma to the area of infection before the immune bodies have been mobilized and before an inflammatory wall has been built about the infected focus merely disseminates the infection, with results that are often disastrous. The process of localization is essential to the safe course of an infection whether it be a simple boil, an abscess about a tooth root or an abscess in a deep-seated abdominal viscus. There are very few exceptions to this rule.

The indications for extraction of a tooth in the presence of a chronic periapical abscess are obvious. To extract a tooth in the presence of an acute, unlocalized alveolar infection or spreading cellulitis is to court extension of the infection, bone necrosis, alveolar abscess, Ludwig's angina, subtemporal abscess, orbital abscess and fatal septicemia. When there is swelling about the jaw or cheek, with a tooth showing percussion tenderness or x-ray evidence of infection, the physician and dentist should advise

against immediate extraction. With several days (or sometimes more) of local heat, bed rest and perhaps chemotherapy, the lymphangitis and cellulitis will be limited or will have subsided. The tooth may then be extracted with relative safety. It is true, as I have often been reminded by my friends in the professions, that thousands of teeth are extracted during the acute stage of infection without ill effect. The unfortunate results in a few cases, however, justify a more conservative attitude.

When an alveolar abscess extends itself

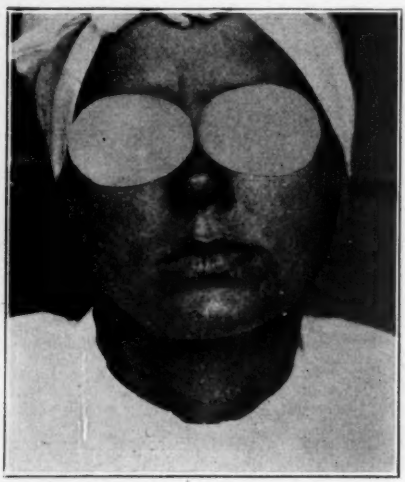

Fig. 9.—Tumor of parotid gland which masqueraded as inflammatory lesion.

in the lower jaw, it may go either medially in the loose tissues of the floor of the mouth, producing a Ludwig's angina, or laterally to form a soft tissue abscess in the cheek or at the angle of the jaw. If the molar region is involved, a third point of exit is upward along the lateral surface of the ramus of the mandible and extending upward between the temporalis muscle and the temporal fossa of the skull. The abscess extends upward, if at all, usually beneath the periosteum, causing destruction of the ramus, as in Case 3. It is sometimes argued that early drainage will relieve tension and avoid bone destruction. This has not been my experience. Here again, it is wise to await localization before incision and drainage. The injury to the blood supply of the bone occurs during the days of massive edema, caused by extension of the cellulitis, which is made worse rather than better by the trauma of incision.

Many simple alveolar abscesses will drain spontaneously through the alveolar process if given enough time. External incision should be delayed until one is certain that alveolar drainage into the mouth will be inadequate. It is a good rule, when in doubt about the necessity for external drainage, to continue hot dressings for a day or two more before making the decision. Here again, the policy of masterful inactivity will win over frenzied haste and injudicious surgery.

The possible routes of extension from the upper jaw are somewhat less complex. Here, the infection goes either beneath the palatal aponeurosis on the lingual side or into the soft tissues of the upper lip and cheek usually, with an occasional extension into the maxillary antrum. Of these three, the second is the most hazardous because of the ease with which such infection may reach the orbit or go by way of the angular vein into the cavernous sinus.

Infections of the salivary glands usually arise through the portal of entry of the ducts. Except for infectious parotitis or mumps, the commonest salivary infection is probably septic parotitis, which occurs during severe illness or follows an operation, when the mouth undergoes continued drying. Painful swelling appears in the cheek from the zygoma down to the submaxillary and upper cervical regions, accompanied by high fever. (Fig. 8.) Examination shows the papilla of Stenson's duct to be red and edematous, and usually no salivary secretion

can be expressed from the duct with gentle pressure over the gland. The lesion is usually unilateral, but occasionally appears on both sides.

With the aid of rest, hot compresses and, in some instances, chemotherapy or x-ray irradiation, the swelling and temperature subside after a few days and the process resolves itself. This is the usual course, but, in a few instances, the gland undergoes necrosis, forming an abscess which requires drainage. Some surgeons favor early and wide incision of the parotid capsule as a prophylactic procedure during the early stages of infection, to prevent pressure necrosis of the gland substance. I have not found the incidence of such necrosis high enough to justify routine surgical incision.

When a calculus is present in either Stenson's or Wharton's duct, the swelling in the region of the gland is likely to be intermittent and to increase with eating. Calculi in Wharton's duct are usually easily felt in the floor of the mouth and easily removed. Parotid calculi are much more difficult to detect either by palpation or by the x-rays and are even more difficult to locate surgically. Long-standing or recurrent swelling of a salivary gland should always be investigated because of the possibility that it may represent a tumor masquerading as an inflammatory lesion. Sialograms or lipiodol injections of the ducts may be helpful in making a diagnosis, but they are not always effective. The submaxillary gland can easily be removed, in case of doubt, and it is best to get rid of a submaxillary gland that has been the seat of continued or intermittent swelling. The parotid gland, however, demands more conservative therapy, because of the inherent danger of injury to the facial nerve. The best exploratory incision is a vertical one in the skin fold just in front of the tragus of the ear, but, to explore the duct and the anterior part of the gland, a horizontal incision parallel to and 1.5 to 2.0 cm. below the zygoma is useful.

The following case illustrates the need for exploration when in doubt.

CASE 7.—A woman, aged 30, developed an acute parotid abscess in 1937. After several days of treatment, the abscess was drained surgically and subsided completely. At this time, the duct was suspected, but exploration showed no cause for obstruction. Three years later, swelling again appeared in the region of the same parotid gland. Again, a calculus in the duct was suspected, but none could be identified and sialograms revealed nothing. Upon exploration of the gland under local anesthesia, the swelling was found to be a mixed tumor of the parotid gland. (Fig. 9.)

The following case illustrates that even surgical exploration may leave the issue undecided.

CASE 8.—A woman, aged 28, had suffered with intermittent swelling of the right parotid region for several years. No calculus was palpable. Sialograms showed the main duct to be obstructed so that no lipiodol went into the smaller radicles at all. The gland was finally explored through a preauricular incision, under local anesthesia. Nothing but evidence of chronic inflammation was found by both gross and microscopic examination of the tissue. Following this exploration, the swelling cleared, only to recur one month later. On this occasion, for the first time, it was possible to feel a small calculus in the duct just proximally from the papilla. This was easily removed through a mucous membrane incision. The swelling has not recurred.

SUMMARY AND CONCLUSIONS

In infections of the skin surface, the alveoli and the salivary glands, the simple principles of rest, heat and avoidance of premature surgical trauma are of paramount importance in treatment.

Extraction of a tooth or incision made in the presence of acute infection may have disastrous results, by disseminating the infection, thus transforming a simple lesion into a very serious one.

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PSYCHOLOGY AS A FACTOR IN THE HANDLING OF DENTURE PATIENTS

By Cecil H. Bliss, D.D.S., Sioux City, Iowa

FOR many years, organized dentistry has, through its meetings and publications, been keeping the members of the dental profession informed as to the latest developments in the field of prosthetic dentistry. Thus, all ethical dentists are given an equal opportunity to keep abreast of the times if they so desire. Yet, in spite of the efforts of recognized authorities, who cheerfully share with us the results of their findings, it must be admitted that the public is not receiving from the general practitioner the full quality of denture service to which it is entitled. The average dentist who is interested in this particular phase of practice would gladly adopt any improvement in technic that would benefit his patient. His problem, however, is not so much to develop a better technic as it is to gain public acceptance of these improvements. This problem has been too long ignored and, as a result, many a conscientious dentist finds himself unable, from a realistic standpoint, to use modern methods in denture construction. If dentists are to give the public the type of denture service to which it is entitled, the members of the profession must be taught how to treat patients' minds as well as their mouths.

A few months ago, at the Iowa state meeting, one full day was devoted to prosthetic dentistry. A well-known instructor gave an illustrated lecture followed by a practical demonstration showing the various steps in denture construction. It was without doubt one of the most educational programs ever presented at any of our meetings. The suggested technic, while not complicated, naturally involved procedures that take considerable time and effort. In the evening, several members gathered in a room for one of those sessions that often turn out to be the highlight of a meeting. The main topic of conversation was the day's program. Everything from technic to practice management was discussed. Finally, one dentist made a significant statement: "While I thoroughly enjoyed the program, it still does not help me to solve my biggest problem. It would be a pleasure to make dentures like that, but to be honest about it, I simply cannot afford to use the technic. It takes too much time. In my practice, I can get just so much for dentures and no more. At those fees, will some one please tell me how I can spend the extra time on my cases and still make a living?" The remarks of this dentist were not made for publication. It was only among close friends that he dared speak the truth. His words were not born of an unprofessional attitude or a lack of idealism. He was eager to give his patients better service, but found himself blocked, not by a lack of technical knowledge, but because of an inability to convince his own patients of the value of better technical procedure. Such is the attitude of hundreds of dentists in all parts of the country and, as a result, much of our scientific research fails to benefit either the public or the dentist.

One of our most perplexing problems

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is finding ways and means of obtaining public acceptance of superior dental work. Since our patients cannot be expected to appreciate that which they do not understand, we must admit partial failure, not as technicians, but as educators. If all dentists knew how to present the story of dentistry, thereby leading people to think in their own best interests, we would see the greatest boom dentistry has ever known; and closely allied would be the greatest advance dentistry has ever known. Every practitioner would be stimulated to improvement, motivated by confidence in his ability to influence patients, for every conscientious dentist is constantly striving for technical perfection, if he can find a market for better methods. The public will never be properly served until dentists are happy in their work. It is almost impossible to maintain a keen interest in any line of endeavor if the rewards are inadequate.

Theoretically, there should be no acceptance problem. Good work should bring its own reward. The honest, industrious dentist of average ability is entitled to a good practice. But there is a vast difference between the theory of practice and actual practice. To our dismay, we find that, in spite of our educational background and the best of professional attitude, our ability to serve exerts too small an influence in the building of a practice. It is the regrettable truth that virtue is not its own reward in a world of practical affairs.

Those of us who practice dentistry for a living know that if we can solve the acceptance problem, serving the public in the best manner possible becomes a joy. But since all of us were graduated from school without any instruction in this tremendously important phase of practice, whatever skill we possess has been acquired by the hit or miss method. A few possess natural ability, which is a priceless gift, and they instinctively know how to handle patients. However, the vast majority of us are not so fortunate and must cultivate this particular quality. The ability to influence people can be acquired by study and practice, just as we acquire skill in anything. Hit or miss methods of handling patients are no more effective than slipshod methods of constructing dentures. The technic to be used in influencing people for their own best interests should be made available to all ethical dentists.

But there are some who misunderstand and loudly protest against any such action. It would be nothing more than teaching "high pressure selling," they say. Nothing could be farther from the truth. Not long ago, the subject of modern salesmanship was discussed with a successful district manager of a large insurance company. He made a statement that is well worth repeating:

> In general, real salesmanship is misunderstood. Those of us who try to be real salesmen have a code of ethics comparable to that of any profession. We have no use for high pressure methods in our business. The public is too intelligent to be fooled by such tactics. There are no tricks in true selling. It is a matter, today, of educational salesmanship. While we know our contract is good, people will not know it unless we explain what our plan will do for them in terms they understand. We never try to force insurance on any one. We attempt to explain it so clearly that instead of us selling, they buy.

Can we as ethical dentists object to that type of education? We, too, have a good "contract." We have health, happiness, comfort, youthfulness and a natural appearance for sale, yet these benefits are enjoyed by a comparative few. To be the potential distributors of benefits is not enough. There are hundreds of capable dentists who have little opportunity to display their skill. We dare not do good work, and let it go at that. There must be a connecting link between production and distribution. The ethical application of the principles of good salesmanship, in an educational

manner, is the means whereby we can make the benefits of modern dentistry available to more people.

While this attitude should characterize our dealings with all patients, those threatened with the loss of their teeth are deserving of special consideration. Most people associate the wearing of artificial teeth with the passing of youth and the beginning of distasteful old age. In their mouths, we see evidence of a heroic battle to save every single tooth, yet, despite all efforts, the day finally arrives when defeat must be admitted. We see such cases every day and are prone to disregard the full significance of this period in the life of the individual. To us, it represents so many extractions and a set of dentures, but, to the patient, it means facing a crisis. These patients need not only the services of a skilled technician, but also the sympathetic understanding of a dentist to guide them safely through this period of mental depression.

It is little wonder that our patients are depressed. No one wishes to experience a sudden transformation from youth to old age. Years pass fast enough without any outside assistance. Patients suffer mentally because they do not know what can be done to maintain a natural appearance. Those fears are based primarily on the type of dentures that they have seen in the mouths of some of their friends and relatives. We can ease their minds by explaining the vast difference between "false teeth" and "artificial dentures."

"Artificial dentures" are a scientifically made substitute for lost organs of the mouth, to be worn for the purpose of restoring the natural appearance, comfort and efficiency as nearly as possible. But "false teeth" are a conglomerate mass of porcelain and base material, inserted in the mouth for the purpose of scaring people. The patient recalls with considerable embarrassment how she momentarily failed to recognize her aunt who was wearing a new set of teeth. The aunt's natural teeth had been large and slightly spaced, but now her smile discloses a nice even row of white dwarfs. While the appearance was bad enough, mealtime revealed qualities heretofore unsuspected. When eating, her aunt sounded for all the world like a telegrapher working frantically at his key. Now and then, the lower denture would seemingly turn a complete flip-flop; whereupon, the wearer would excuse herself, to return in a few moments for a fresh start. Our patient shuddered at the thought of what the future might have in store for her. It was her fervent hope that when her turn came, she could at least get a set that would look decent. Like so many others, she does not know that there are thousands of people who wear dentures so skilfully made as to escape detection. Artificial dentures pass unnoticed; only "false teeth" announce their presence.

An attempt was made to get the reaction of the average person by selecting twenty-five people at random and asking them: "If you were to lose your teeth and be forced to wear artificial dentures, what would concern you most—how the dentures would function in chewing, whether or not they would be comfortable or how they would look?" Twenty-three of the twenty-five placed appearance first. The other two wanted comfort. Surprisingly enough, one of the two who mentioned comfort first was a young lady. Upon further questioning, she gave this explanation: "One of the men in our office has been going through the experience of losing his teeth. He just got them yesterday. Honestly, I was amazed. His new teeth are beautiful—not because they are lined up nice and even, but because they look just like his natural teeth. He paid quite a little for them, but, after all, an artist should be rewarded. People are perfectly willing to pay more if they can be assured of looking like human beings instead of mon-

keys." With her own eyes, this young woman saw just what a modern dentist could do for one of her friends, and she thereupon lost her fear of wearing dentures. It is interesting to note that while she mentioned comfort, actually her main concern, like that of the other twenty-three, was appearance. Therefore, in educating the denture patient, we should lay special emphasis on esthetics, because a pleasing appearance is something nearly all people desire.

The dentist who explains the value of preextraction records, photographs, face masks and other means of preserving a natural appearance always has the undivided attention of his patient. Our patient would be much relieved to hear such a story. Not only would she gladly deny herself many things in order to purchase these additional refinements, but also the dentist who dispells her fears will earn her undying gratitude. We know that any set of dentures, to be worn successfully, must also be comfortable and efficient, but patients cannot properly appreciate these benefits until they have worn artificial teeth. It has been said that efficiency is beauty. This may be true in some cases, but after watching a woman well past 80 spend several minutes carefully examining her new dentures from all angles, it must be concluded that if they are not too old to hold a mirror, they are young enough to be interested in their appearance.

Every dentist should have a carefully planned educational talk that will lay the foundation for cheerful acceptance of adequate service; for regardless of how much people dread the wearing of dentures, they too often are more concerned over what they will cost. Patients may know very little about denture construction, but when money is mentioned, we speak a common language. Every one resists the spending of money, and this is only natural. It has been especially noticeable in recent years when incomes have been somewhat reduced. Even so, it need cause us no particular concern when a patient abruptly asks, "What do you charge for plates?" unless we answer the question too soon. The dentist who quotes a fee before presenting his plan has only himself to blame if he is forced to haggle over the fee. If we permit the attention of the patient to become focused on money and money alone, we are guilty of gross negligence. When the patient understands the benefits to be enjoyed, the cost ceases to be the paramount issue. A presentation based on the fundamental laws for marketing all goods and services throughout the world will enable the patient to make an intelligent selection of the service best suited to his needs.

I. EMPHASIS ON BENEFITS, NOT TECHNIC

Five of these laws or principles have been selected for study, the first one being "emphasize benefits, not technic." Let us state what we can do for people rather than how we are going to do it. Several years ago, the Simmons Bed Company was in financial difficulty. Their advertising had been featuring the superiority of their products by showing how the mattresses and bedsprings were constructed. The apathy of the public toward this type of advertising was manifested in the sales. In desperation, the company decided to use new material, featuring benefits. Instead of spring construction, they sold eight hours of pleasant, restful sleep. People became interested, interested enough to buy, and the company was saved from bankruptcy.

Insurance was formerly presented strictly as a means of protecting the family after the death of the wage earner. While every normal man wants to provide for his loved ones, it is not pleasant to contemplate death. In those days, insurance companies were small, and perhaps for that reason. The approach has been restyled. The protection is still there, but there is the merest suggestion of death. Today, the alert salesman

stresses the pleasant side of an adequate insurance program. He shows how we can retire, to spend our old age free of financial worry. We see ourselves as retired gentlemen spending the winters in the South and the summers in the North. Our lock boxes may be full of policies, yet we "find" the money with which to purchase these benefits.

Patients will react in the same manner if we feature benefits instead of giving them a discourse on some phase of denture construction.

Some time ago, a woman came to our office to inquire about dentures. Much time was spent in explaining the wonders of a new articulator on which we planned to build the case. In the course of the conversation, the patient was casually shown a completed case that happened to be sitting on the cabinet. After she had decided to place herself in our hands, she was asked this question: "Because we are very much interested in the reactions of our patients, would you mind telling me just what caused you to decide on that particular case?"

She answered frankly: "While you were talking, I kept looking at those dentures on the cabinet, and I decided that if I could get some that looked as good, wearing false teeth would not be so bad." Not one thing had been said that really interested her. She cared little about that lovely instrument. What she wanted to hear was an explanation as to how good denture service would benefit her. From that time on, articulators have been discussed only with dentists.

Another woman burst into the office one day and without ceremony asked if we could make her a set of teeth for $50. "If you can't, just say so, and I'll be on my way, because I have just exactly that much to spend and not one cent more," she added. She was assured that a set of teeth could be made for the amount she mentioned, but that we owed her a careful examination plus an explanation of just what could be done. After she had been seated in the chair, an educational talk was given that stressed better appearance and youthfulness (the patient was well past 50) and since she was wearing ill-fitting dentures, we mentioned how deep creases in the face could be removed by properly constructed dentures. When she heard the word "crease" her interest was aroused. "That's what worries me," she said. "My complexion has always been good, but I simply cannot get rid of these deep lines in my face." With that important bit of information in our possession, we dropped the subject of artificial teeth and dwelt thereafter on properly fitting dentures that would also remove creases. She had exactly $50 to spend for teeth, yet she was very happy to invest considerably more in "crease removers."

Even materials should be interpreted in terms of personal benefit. We have all heard people say with considerable pride, "I have genuine 'Bite Right Teeth' in my plates." Where did they get that idea? From a dentist who talks materials and not service. What will be his explanation to a patient who discovers that her neighbor paid but half as much for dentures with the same kind of teeth? The same materials may be purchased by all dentists. The difference lies in how these materials are assembled. When the patients' attention has been focused on what we can do for them, the choice of methods is left to us.

2. PROVING YOUR STATEMENTS

The second principle is: "Prove your statements" or "Prove your ability." To say "In my opinion," or "This is what you should have," does not carry sufficient weight. The public needs something tangible on which to base a decision. The proof must be more conclusive. It is rather presumptuous of us to expect our patients to buy entirely on

faith. The best method of proving our ability is to show what we have been able to do for others. What is more reassuring than to see pictures of people who have gone through the same experience? Those taken in color and showing the patient before and after treatment are especially effective. A friend tells a story about a case involving a young girl whose teeth were knocked out in an automobile accident. As is his custom, he photographed the patient before starting the case and after it was completed. When the insurance adjuster came to effect a settlement, he was ready. His past experience with insurance cases had been unsatisfactory. This time instead of attempting to explain what had been done, he showed the slides. When the adjuster saw the whole series, he took out his checkbook and paid the bill in full, saying, "You earned every dime of that fee." If pictures will melt an adjuster, their value cannot be overestimated.

Lacking pictures or slides, the next best means of reassuring patients is the demonstration model. When properly used to illustrate types of cases and not as samples, models play a definite part in an educational program. Sometimes, one look is worth many words. Duplicates of actual cases are much more desirable than the so-called samples. Patients are always more interested in practical cases, as was the first patient of whom I spoke a moment ago.

Another method of proving our ability is to relate the reactions and experiences of those who are wearing dentures. By telling of other patients who selected the same type of case under consideration and were very happy in their choice, we add considerable weight to our story. The patient in this way is given an indirect invitation to join a group of happy, satisfied people. It is far more effective to quote patients than to state opinions. Proving what we can do before we do it is very difficult, calling for the use of all three methods.

3. USING CAREFULLY SELECTED WORDS

The third principle is: "Use carefully selected words." Perhaps we have relied too much on illustrative material and have overlooked the power of words. Over our loud speakers, we hear nothing but a voice. We cannot see the announcer or be influenced by his personality, yet large companies gamble millions on the educational value of carefully selected words. Wheeler in his excellent book entitled "Tested Sentences" furnishes conclusive proof of the importance of carefully selected words. Men refused to consider the use of deodorants when the sign read: "For excessive perspiration," but when the placard read: "For athletic men," the sales were greatly increased. Lux Flakes comes in two sizes of cartons, but no one seemed to want a large size box until it was renamed the "economical size" package. One patient wearing disfiguring dentures was unable to understand why a change should be made until she found out that it was possible to look ten years younger. Another patient "simply could not afford anything but very inexpensive artificial teeth," yet cheerfully arranged for a case involving the taking of preextraction photographs and records so that he might be assured of continuing his successful career as a salesman.

We must be careful to choose words that are easily understood. We should at all times avoid the use of technical terms. One elderly man abruptly ended the efforts of a young dentist to explain what was needed by saying, "Son, you've been talking for about fifteen minutes and so far you haven't said anything that I can understand. Getting teeth is like buying a cat in a bag. Anyhow, your price is all right and my sister says you know your business, so let's get going." Perhaps many of our patients think the

same thing. At any rate, if our presentations are not easily understood by the average eighth grade student, we are probably talking over the heads of most of our patients. Simple, well-selected words and phrases should be used by all dentists who wish to give patients the best service that they are capable of rendering.

4. GUIDING PEOPLE BY THEIR EMOTIONS

Principle number four is: "People are guided largely by their emotions." It has been said that the average man does not perform an act of pure reason during an entire lifetime. While behavior is purposeful, the motivating force is emotional. Nearly all advertising is based on this premise. Plain statements of fact are of little value, say advertising experts. About two years ago, the Sinclair Oil Company ran a series of ads showing how battleships, submarines and even the Empire State Building could be lifted by the energy stored in 1 gallon of gasoline if all its power could be utilized. These ads caught the public fancy and gasoline sales reached an all-time high. Finally, after the oil company had landed the contract to furnish oil for the Navy, the firm decided to boast a little by telling this fact in another series of advertisements, assuming that if their gasoline was good enough to run our battleships, the public would try it for their cars. So their copy read: "The Sinclair Oil Company furnishes oil for the U. S. Navy," which was a plain statement of fact. Their gasoline sales dropped at an alarming rate and it took many months' effort to regain the former position. So it is with patients. Plain statements lack that certain something that causes people to decide. Therefore, we do not dwell too long on the ability to properly masticate food or the balancing of the occlusion because people are not affected by such statements.

A woman decided to have her dentures rebased, not because they were loose, but because the lower teeth were disappearing. Despite every effort, it seemed that one patient would never part with his infected teeth, since it meant the wearing of dentures, until it was suggested that the extractions might clear up his back trouble and thereby help his golf swing. It matters not whether we bring in seemingly irrelevant considerations to influence people so long as our plan is for the good of the patient.

5. THINKING SUCCESS

The last principle is: "Think success." Nothing can be accomplished by a man in any business or profession if he is a negative thinker. A year ago, when our territory was completely burned out, one agency broke all records for the amount of insurance sold during a one month period. It was unbelievable. The lawns were brown; the corn was gone; there had been no rain for weeks; yet this group of agents succeeded in overshooting their goal. The district manager was asked how this miracle had been accomplished. He said that during that month this had been their slogan: "If you are not selling, the fault is primarily yours, not the times. Since we have no control over economic conditions, we must accept them; not because we want to, but because we have to." Dentists rightfully should accept the slogan that "The public needs good dental service today as always" and that when they do not accept our suggestion, the fault is largely ours—not theirs. To censor the public for an apparent lack of appreciation is to admit that we have not been putting forth sufficient effort to gain their acceptance. In spite of crop failures, drought and even the much talked about depression, many dentists have gone serenely on building bigger and better practices. These men think and act in terms of success.

Most of us, however, do not view the

practice of dentistry from an optimistic standpoint. When conditions are bad, we sit back and justify our inactivity by complaining. No one should permit himself to indulge in this habit. Negative thinking does us more harm than all our worst enemies put together. An enemy can be avoided, but we can never escape our own thoughts. If we are not sold on ourselves and our work, there can be no success. One of our main troubles has been that we have assumed the rôle of custodian of the patient's pocketbook without having been asked. Who should decide what the patient can afford? Not long ago, one young woman voiced her disapproval when she said: "I will never forgive that dentist for not telling me what could have been done to reproduce the natural appearance of my face and teeth. It is true, his fee was very reasonable, but why was I not given an opportunity to purchase better dentures? If he thought that I was unable or unwilling to pay for such service, he assumed more responsibility than was his right. I would gladly have paid twice as much for a set of real dentures. It is too late now. The chance to accurately reproduce the arrangement of my teeth has been lost."

Patients should be given the opportunity of making their own selection unless we know definitely that they can afford nothing but a modest denture. Even then we may be wrong. One dentist had a case that was surprising to say the least. An elderly couple, poorly dressed, visited his office one day when he was very busy. They looked so out of place that his nurse practically pushed them out of the office. When the dentist heard about it, he rushed down the hall to try to find out what they wanted. When he learned that they had been sent by one of his patients, he invited them to return to the office. They both needed dentures and he naturally suggested something very reasonable. "Too cheap," they said. In fact, everything was "too cheap" until he mentioned gold base dentures. And that was what they insisted on having. Later on, this dentist told his nurse that she had almost caused him to lose $800 worth of denture work. While this story is unusual, it does illustrate a point. Regardless of where we practice, we shall have a certain number of patients who will be satisfied with nothing but the best. It is our duty to tell all patients what can be done, leaving the final decision to them. Many a dentist has never given his patients a chance to enjoy some of the refinements in denture construction, because he does not think in terms of success.

In presenting these five principles, I have merely endeavored to arouse more interest in the psychologic side of handling the denture patient. Old methods of handling patients are no longer effective. The public has become wary since the crash of '29. People nowadays feel that it is safer to say "No" and then ponder over the wisdom of their decision. The reaction of business has been to tighten its belt and fight all the harder for a share of the family budget, while dentistry, because it is unprepared to cope with the situation, puts in a feeble bid for its just proportion. Our profession could be likened to many of the fallen European countries who had right on their side, but not enough modern equipment.

We stand ready and willing to render an honest service to a needy public, yet we find difficulty in solving the public acceptance problem. If we can give better service by using educational salesmanship to influence our patients, we are more than justified in using it. It is not the purpose of this study to advocate the use of tricks in selling, but to make the benefits of modern dentistry available to more people by banishing from the minds of the patient doubt, miscon-

ceptions and prejudices—all destructive to the discharge of our duty as dentists. When this has been done, we shall have ample opportunity to display our artistic and technical ability.

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CLINICAL ORAL PATHOLOGY AS RELATED TO ORAL DIAGNOSIS

By WILLIAM LINTZ,* M.D., Brooklyn, N. Y.

PERHAPS the most helpful manner of presenting the subject of clinical oral pathology as related to oral diagnosis will be to enumerate the various oral diseases that I have encountered, indicating the clinical laboratory methods that have helped in their diagnosis and treatment and emphasizing some of the important ones.

GINGIVAL LESIONS

Chronic gingivitis, scurvy, bismuth pigmentation, gingivitis with hyperplasia, chronic Vincent's gingivitis, pyorrhea alveolaris, hyperplasia of the gingivae and edentulous tissues, acute gingivitis, mucous patch and allergic gingivitis were the gingival conditions encountered.

Scurvy.—Since the beginning of the depression, scurvy is no longer rare in this country. While it is seldom seen in severe stages, I have seen many mild cases. The patient is pale, anemic, underweight and weak. The gums bleed and are sore, spongy and congested. They may have hemorrhagic edges. In more advanced cases, the gums show a bluish bloating of the gingival tissue. The teeth are carious and the gums infected and the breath is foul. Later, the teeth become loose and fall out and the alveolar process undergoes necrosis. Frequently, subperiosteal hemorrhages cause tender swelling of the rami of the lower jaw. Ulcers in the mouth become hemorrhagic, with blue or livid edges, refusing to heal. Vitamin C or raw fresh fruit juices will cure scurvy. It is difficult to diagnose mild cases without a vitamin C determination.

Vincent's Infection.—The low-grade gingival type of this disease is common. Vincent's infection was frequently seen after the first World War, but bacteriologic tests now prove it rare. Chronic Vincent's infection is often associated with a hyperplastic gingival reaction, and rich bacterial flora may be demonstrated under gingival tabs in the presence of Vincent's organisms. Repeated medication with irritating and stimulating chemicals frequently prolongs this condition.

STOMATITIS

Chronic aphthous stomatitis, chronic stomatitis, ulcerative stomatitis, acute aphthous stomatitis, stomatitis from drugs, chronic stomatitis from the biting habit, gangrenous stomatitis and bismuth poisoning are the types seen.

In all pyogenic conditions of the mouth and gums wherein bacteriologic tests reveal virulent micro-organisms, i.e. *Staphylococcus aureus,* streptococcus, pneumococcus, etc., my advice is to be "hastily radical"; by which I mean, terminate the suppuration immediately, even if radical procedures such as operation or extraction are necessary. Opera-

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tions should not be neglected for even the newer specific chemotherapies, such as sulfanilamide, gentian and mercurochrome therapy. Since the advent of these new, powerful germicides, there is a tendency to procrastinate with "conservative treatment" at the expense of surgery, which they were never meant to replace. Frequently, during treatment, irrigations and sleep, and in children struggling in the dentist's chair, intrapulmonary aspiration of pyogenic material results in fatal suppurative pneumonia and pulmonary abscesses, wherein the same micro-organism is found as in the oral infection. I have seen necropsies corroborate this neglect.

In all infectious lesions, spreads and cultures will be of great help in diagnosis and therapy.

TONGUE LESIONS

Glossitis areata migrans (geographic tongue), congenital fissured tongue, syphilis of the tongue (chancre, mucous patch, gumma, lingua lobulata, atrophic syphilitic glossitis), chronic glossitis, atrophic glossitis (secondary anemia, atrophic glossitis), pernicious anemia, tuberculosis, ulcerative glossitis, papillitis, glossodynia, lingua nigra, hairy tongue, pseudohairy tongue, glossitis rhombia mediana, traumatic glossitis, macroglossia and varicosity are among the tongue conditions.

Syphilis.—Extragenital chancre is more often situated on the upper lip than on the lower; on the tongue and on the tonsils. It is not so hard as when on the genitals, and the surrounding edema is more marked and the neighboring lymph glands are enlarged. While *Spirochaeta pallida* can be demonstrated in the exuded serum in each instance, the Wassermann test at this stage is usually negative, just the reverse of what it is later.

The mucous patch is the most constant infectious and characteristic syphilitic lesion that the dentist meets. Papular, slightly elevated and glistening, it is frequently covered with a white or yellow exudate and may be located anywhere on the oral mucous membrane, tongue or tonsil. It may persist for months and recur for years. Dark-field examination and Wassermann tests are positive at this stage.

There are a great number of spirochetes in the secondary stage because of the rich tongue vascularization. If the condition is inadequately treated, endarteritis of the smaller vessels results. Later, owing to the interstitial sclerosing process and the resulting decrease in blood supply to highly specialized end-organs, the papillae undergo atrophy, with resultant smooth, bald areas on the tongue surface. Subsequently, a leukoplakia develops, usually as a result of irritation from the products of combustion and the heat of smoking. Leukoplakia lesions may later develop into carcinoma, which explains the high incidence of carcinoma of the tongue in syphilitic glossitis.

Prophylaxis and arsphenamine, bismuth and iodide therapy are the proper measures in these cases.

In tuberculosis, stained spreads for the tubercle bacillus give the best results.

LIP LESIONS

Chronic cheilitis, intertrigo labialis, cheilitis exfoliativa, cheilitis glandularis (apostematosa), cheilitis venenata, fissure of the lip, chronic lymphangitis and chancre are the lip lesions encountered.

Cheilitis venenata is rare, and therefore I believe that the ubiquitous lipstick is harmless. Chronic cheilitis is due to a deficiency of riboflavin and quickly clears up under its administration.

NEOPLASMS AND CYSTS

Squamous cell carcinoma (buccal mucosa, lip, palate, floor of mouth, gingivae, tongue), epulis (fibrous, granulomatous, giant cell), acanthoma, fibroma (tongue, buccal mucosa, lip, gingivae, palate), angioma, lymphangioma, granuloma,

granuloma pyogenicum, adamantinoma, fibroangioma, mixed tumor, papilloma, osteoma and cyst (ranula, mucous cyst of the tongue, lip and mucous membrane, embryonal cysts) are among the neoplasms encountered. Biopsy will differentiate doubtful cases.

DERMATOSES

Lichen planus (oral), lichen planus (oral and skin), pemphigus vegetans, oral pemphigus, angioneurotic edema, lupus erythematosus, erythema multiforme, herpes labialis, herpes recurrens, purpura hemorrhagica, lupus vulgaris and herpes buccalis are the dermatoses.

A prolonged bleeding time with an almost normal coagulation time marks purpura hemorrhagica.

Angioneurotic edema is a colorless swelling of varying size which may be located in the mouth or on the face or other parts of the body. It may last from hours to months, but usually disappears within a day, spontaneously, as it came. It may be painless, burning or excruciatingly painful. This allergic manifestation, caused by extravasation of fluid from the capillaries into the surrounding tissues, is comparable to hives and hay-fever. Ingestion of certain foods or inhalation or contact with substances to which the patient is allergic produces it. Skin tests and the history will indicate the diagnosis.

MANIFESTATIONS OF BLOOD DYSCRASIA IN CONSTITUTIONAL DISEASE

Atrophic glossitis, secondary anemia atrophic glossitis, pernicious anemia, acute gingivitis, aplastic anemia, hypertrophic glossitis, monocytic anemia, hypertrophic gingivitis, chronic myelogenous leukemia, acute gingivitis, tonsillitis with ulcerative glossitis, tuberculosis, tuberculosis cutis orificialis, pellagra, chronic gingivitis, diabetic and chronic atrophic glossitis and avitaminosis are manifestations of blood dyscrasia.

Pernicious Anemia. — Dentists frequently condemn the dental work of their predecessors; remove and alter the dentures involved, and extract or restore the teeth that are supposedly responsible for pain, burning, smarting and "a peculiar feeling of the tongue and mouth." In the presence of these symptoms and faultless dental work, pernicious anemia is suspected. The tongue and mouth are involved from the beginning, and supply the most dominant complaints. The tongue appears red, glazed and smooth, with atrophic papillae and superficial excoriations at the edge, and is usually uncoated. Pyorrhea is common. The lips are pale and the face and mucous membranes are lemon color. Petechiae may be present anywhere in the oral mucous membrane and skin. A blood count will indicate the diagnosis, showing a marked reduction in red cells, a slighter proportionate reduction in hemoglobin, giving a color index of +1, diminished reticulocyte and megacyte counts, leukopenia and lymphocytosis. The stomach invariably has no free hydrochloric acid because its mucosa is atrophic. Marvelous results may be obtained from liver therapy and administration of hydrochloric acid.

In leukemia, myelocytes are found in the blood.

In pellagra, nicotinic acid will quickly relieve and cure the condition.

Diabetes Mellitus.—Dental destruction is a conspicuous symptom throughout this disease and often precedes the malady by years. I often wonder if diabetes is not caused by some unknown germ in the mouth which affects the endocrine system, initiating the disease. Whenever there is an unwarranted destruction of teeth, marked pyorrhea, weakness, pruritis, redness and dryness of the tongue and excessive thirst, in a fat person (in nine out of ten cases of beginning diabetes, the patient is fat), the dentist should think of diabetes. We now depend more upon the blood sugar than on the urine sugar determination, and a

negative glycosuria reaction does not exclude diabetes. I do not know of a better treatment for diabetes than the eradication of dental infection. *Staphylococcus aureus* is the most frequent offender in diabetes, causing more infections than all the other micro-organisms combined.

DRUG GROUPS

Bulbous stomatitis (phenolpthalein), vesicular eruptions (barbiturates), hyperplastic gingivae (about 50 per cent of prolonged treated cases) (dilantin sodium) and vesicular eruptions (potassium iodide) are conditions arising from ingestion of drugs.

DEFICIENCY DISEASES

Dental caries is evidently due to dietary deficiencies, and, hence, amenable to treatment. I believe that the amount of cereal eaten, particularly during infancy and the earlier years of life, should be reduced, and should be replaced by increased consumption of milk, eggs, butter and potatoes and other vegetables, as well as fruit, especially oranges. Vitamin D and calcium should be given from birth, and even before, through the mother, to prevent later tooth decay.

SPECIAL AND MISCELLANEOUS LESIONS

Cancerphobia, Fordyce's disease, Vincent's (tonsil) neuralgia, torus palatinus, exostosis, chancre of the tonsil, chancre of the buccal mucosa, alveolar abscess, absence of enamel, mottling of the enamel, xerostomia, parotitis, osteomyelitis, syphilophobia, hemophilia, calculi (gingival), alae gingivae, ptyalism, abscess of the palate, sinusitis, abscess of the cheek, argyria, cervical adenitis and cleft palate are other conditions encountered.

Fordyce's Disease.—This is a common and normal finding. It is an oversecretion and hypertrophy of the sebaceous glands, which become more conspicuous, indicated by glistening reddish gray nodules, usually the size of a pinhead, painless and located anywhere in the body. Secreting glandular lesions may cause disagreeable symptoms of the lip owing to excessive secretory activity.

Septicemia and Bacteremia.[3]—We can readily diagnose a stomatologic expression of a general bacteremia. In nine cases out of ten, the diagnostic sign is there before our eyes. The presence of petechiae is absolutely indicative of the true state of affairs. Not a blood count, but a positive blood culture, will clinch the diagnosis, and should be instituted before any oral work is done in order to assure proper treatment.

Since our treatment of bacteremia has been revolutionized by specific sulfonamide chemotherapy, it is essential to know the etiologic agent, for the sulfonamides are mostly efficacious for a specific micro-organism.

Sulfanilamide is used in the treatment of chancroid, gas gangrene *(Cl. welchii)*, hemolytic streptococcus infections (abscesses, adenitis, Ludwig's angina, cellulitis, empyema, erysipelas, impetigo, lymphangitis, mastoiditis, meningitis, miscellaneous, osteomyelitis, otitis media, peritonitis, peritonsillar abscess, pharyngitis, pneumonia, puerperal sepsis, scarlet fever, septicemia, sinusitis, tonsillitis, ulcers), lymphogranuloma venerum, meningococcal infections (meningitis, septicemia), *Streptococcus viridans* infections (abscesses, cellulitis, meningitis, osteomyelitis, peridental infections, septicemia), trachoma and urinary tract infections *(Streptococcus hemolytus, Proteus vulgaris)*.

Sulfapyridine is used in the treatment of gonococcal infections (arthritis, endocarditis, gonorrhea, ophthalmia), pneumococcal infections (mastoiditis, meningitis, otitis media, peritonitis, pneumonia, acute sinusitis) and staphylococcal infections (meningitis).

Sulfathiazole is used in the treatment of infections in the colon, gonococcal infections (arthritis, gonorrhea), pneumococcal infections (pneumonia), staphy-

lococcal infections (carbuncle, cellulitis, osteomyelitis, pneumonia, septicemia), urinary tract infections *(A. aerogenes, B. pyocyaneus, Esch. coli, Staph. albus, Staph. aureus)*.

Gastrointestinal Disease. — According to some dentists, the diagnosis of various stomach ailments is exceedingly simple. Almost all oral complaints and findings which the dentists cannot explain are attributed to stomach trouble, and particularly to "acid stomach." As though the normal stomach were not acid! As a rule, in such cases, no gastric hyperacidity is found, but there is often a complete achylia gastrica (anacidity), much to the wonder and dismay of the patient. Patients with gallbladder disease complain of oral symptoms much more than those of gastric disease. I find that 40 per cent of the patients with pathologic gastric conditions exhibit no oral symptoms. The remainder, irrespective of whether they have hyperacidity or anacidity, complain of such vague symptoms as sourness, bitterness, dryness, salivation, coating of the tongue and oral infection. I know of no oral signs, subjective or objective, by which we can diagnose hyperacidity of the stomach. A gastric analysis, which is simple and safe, must be made in each instance to determine the diagnosis. Without it, we cannot make a diagnosis. I find, furthermore, that there is no parallel relationship between the reaction of the mouth and that of the stomach. The dentist should bear in mind that oral symptoms may be due to a disturbance of the nervous system, both functional and organic, an allergy and endocrine and metabolic disturbances, as well as infections, ingestion of drugs, etc. It is well to remember that atropine or belladonna may be responsible for xerostomia[3]; pilocarpine for salivation, and the iodide which the patient is taking for a thyroid disturbance, for that metallic taste. The last statement can be readily proved by placing the saliva in contact with starch, which turns blue in the presence of iodine. Skin tests will rule out allergy. For salivation in general, I find that a tablespoonful of 2 per cent solution of aluminium acetate to a glass of water is far more efficacious than sodium bicarbonate for neutralization of the ubiquitous, imaginary hyperacidity.

SUMMARY

1. Clinical laboratory procedures are prerequisite to oral diagnosis and treatment.

2. The dentist should have at least a speaking knowledge, if not a working knowledge, of these various laboratory methods employed.

3. Many obscure and obstinate conditions are merely expressions of systemic disease; e.g., pernicious anemia, diabetes and leukemia.

4. In explaining obscure mouth conditions, "acid stomach" is not to be incriminated. Every stomach is acid.

5. Many obscure and obstinate conditions can be cleared up by certain laboratory procedures, if the dentist will only avail himself of them.

6. More than ever, it is necessary today to determine the bacteriologic conditions in the infection by the institution of specific sulfonamide therapy.

7. The dentist, in common with the physician, must consider deficiency disease, since avitaminosis is frequently expressed in the mouth.

8. Endocrinosis is a common problem of the dentist as well as the physician.

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BIOLOGIC CONSIDERATIONS IN RESTORATIVE DENTISTRY

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In speaking of biologic considerations in restorative dentistry, we must deal with three tissue structures: the pulp of the tooth, the gingiva and the periodontal membrane. Their favorable and unfavorable reactions to our operations depend on the degree, duration and kind of injury involved. The readiness of these tissues to respond depends to a great extent on the local and general systemic reactions. We know that the tissues of different individuals do not react similarly to the same irritations. Some individuals react to injury with severe inflammation, while the same injuries will heal promptly in others. Some are naturally immune to certain microorganisms, while others will react with violent local or general disturbances on the intrusion of these bacteria into the body. A few of the principles of these reactions are well established, while others are still unknown.

Considering the reaction of the pulp with regard to restorative operations, we must deal first with the size and anatomic peculiarities of the pulp cavity, which is large in the young, becoming much narrower in older people. The pulpal horns must be carefully avoided in preparing a cavity in the young person, especially in proximal cavities. The side walls of the pulp chamber become considerably thicker with advancing age, and there is, therefore, not so much danger of involving the pulp in preparing a cavity. However, we may be surprised to find occasionally that, in opening very shallow cavities, there may be an exposure. The explanation for this may be found in the fact that the pulp horn sometimes remains in its original position even after the pulp itself has recessed considerably. Figure 1 shows one of these cases.

In one dentin cusp of a molar, the pulp horn reaches almost to the dentinoenamel junction. Living pulp tissue can be seen in this small space. If it is necessary to prepare a cavity in a tooth as shown here, injury to the pulp will be unavoidable. We might not be able to observe the pulp exposure and a filling might be placed. If no infection occurred, and the reactions were favorable, secondary dentin might close the small space and nothing would happen to the remainder of the pulp. However, if the tissue reaction is unfavorable, sooner or later the tooth will display signs of pulp and periodontal disease and the vitality of the pulp will be lost.

This discussion leads us toward the question of pulp capping and pulp amputation. An explanation of the outcome of these operations has already been given: If tissue reactions are favorable, the operation is successful. Otherwise, it is a failure. Of course, there must be proper clinical treatment. From the biologic point of view, we must require that no irritating or coagulating drugs be used. If we must use a hemostatic drug, we should use one that does not coagulate the tissues, but only constricts the blood vessels, such as epinephrine, or a drug that does not destroy tissues, such as hydrogen peroxide. The use of this drug

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From the Foundation of Dental Research of Chicago College of Dental Surgery, Loyola University.

does not cause lasting injury. It stops bleeding and the drug acts as a disinfectant as well. In its action, it develops nascent oxygen, which penetrates the tissue spaces, with compression of the capillaries. The oxygen bubbles disappear in a short time without permanent damage.

Pulp capping or pulp amputation has proved successful when the pulp has been exposed accidentally, the decayed dentin has been removed and the pulp is in a normal, not an inflamed, condition.

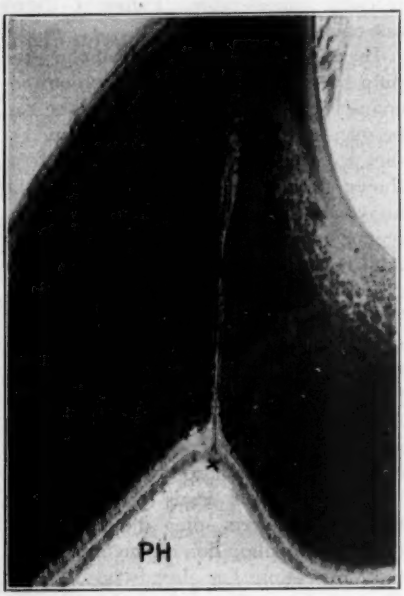

Fig. 1.—Dentin cusp of developing molar. PH, pulp horn. At X, the pulp can be followed as a fine channel high up into the cusp.

When the pulp is inflamed, we cannot expect a favorable reaction, in a high percentage of cases. If the patient can be kept under observation, an effort to save the pulp by capping or amputation may be attempted in favorable cases. Many good results have been reported during the past years.[1] The best results seem to have been obtained by the use of calcium hydroxide. A bridge of new dentin often formed over the amputated pulp stump and complete healing of the wound occurred. Usually, the dentin formed was absolutely normal and odontoblasts lined the dentin bridge toward the pulp tissue. However, the formation of a dentin bridge is not definite evidence of a favorable reaction. Cases of pulp amputation have been reported, showing the dentin bridge developed, but the pulp entirely necrotic. It must have disintegrated after the dentin bridge was formed.

This shows a possibility of an unfavorable outcome from vital pulp amputation, and it is also true for pulp capping, even after a favorable start. There are limited indications for these operations. However, there are cases in which it should be attempted, such as in teeth the root end of which has not quite closed. We can hope for completion of root formation even though amputation or capping of the vital pulp failed. With the apex formed, a successful root-canal treatment can be expected and the tooth can be saved.

In capping an accidentally opened but otherwise normal pulp, the following procedure has also proved successful. Rubber dam is placed and the bleeding stopped with hydrogen peroxide, small cotton pellets being used without pressure on the pulp. The cavity is dried with cotton and by gently blown air. With a sterile round bur, which should be rotated slowly, some dentin shavings are drilled from the wall of the cavity. These shavings are directed to the surface of the exposed pulp until it is entirely covered. Then the cavity is filled with cement. From experimental findings, we know that the human pulp will often react favorably to the implantation of dentin shavings and that new dentin will be formed around the implanted dentin particles, thus closing the opening in the dentin wall.

It is startling to find, when a patient comes in for a regular six-month

check-up of the teeth, and sometimes only after a bite-wing x-ray picture has been taken, that there are some deep cavities which may even extend into the pulp chamber, without the patient's having been cognizant of the slightest disturbance. On the other hand, we know how patients can be annoyed by very slight cavities, or even an exposure of the cementum surface without decay. We are not in position yet to connect these different reactions with a certain histopathologic picture. Investigations are being conducted at the present time in an effort to explain these differences. In microscopic specimens, we sometimes find caries progressing almost to the pulp —even the secondary dentin is invaded —without any inflammatory reaction, as would naturally be expected, as seen in Figure 2. This pulp would of course be exposed immediately upon excavation of the soft dentin. However, there had been no complaints on the part of the patient. It is possible that in cases like these a conservative procedure would be indicated. If we remove the decay without exposing the pulp—even leaving some of the infected dentin in the cavity—we might be able to save the pulp from exposure. Some nonirritating disinfectant should be used in sterilizing the remaining infected dentin, and after this area is covered with cement, the permanent filling could be placed, in a few days or a longer period, in order to determine whether there has been any reaction.

Fig. 2.—Pulp (P) of molar almost exposed by caries (C). The carious infection penetrated also into the secondary dentin (SD). The pulp does not show any inflammation, only edema and widening of the capillaries.

Figure 3 shows a case in which a thick layer of secondary dentin separates the soft carious dentin from the pulp, but the bacteria have penetrated at certain areas to the pulp, severe inflammation with abscess formation resulting. It might be possible to excavate this cavity without exposing the pulp, but a favorable outcome would be doubtful. These two cases are examples of the difficulties we

sometimes encounter in trying to diagnose a pulp condition and draw the best practical conclusion.

It might be just as amazing to the practicing dentist as it is to the research man to find that, after a cavity preparation, carried out according to the strictest requirements, some bacteria had been left below the floor of the cavity.[2] This, of course, shows that bacteria will penetrate hard dentin, and the dentin is not necessarily softened where bacteria are formed. It has been proved lately that bacterial invasion precedes softening by decalcification. The removal of all the soft dentin is no guarantee of the removal of all bacteria present in the dentinal tubules.

Fig. 3.—Deep carious cavity (C) on occlusal surface of molar. The caries stopped largely at the secondary dentin (SD), but, in a few places, bacteria (B) penetrated into the secondary dentin and into the pulp-horn, an abscess (A) resulting.

This fact brings up the question of using a disinfecting agent in cavities before placing the filling, and also the question as to what happens to bacteria left under a filling with well-sealed margins. A series of experimental investigations are necessary for definite conclusions. Some investigations have shown that bacteria can be found under fillings placed from eight to ten years previously, without signs of growth or other activity that would cause severe tissue reactions.

It is possible that these bacteria remain inactive for many years in the dentinal tubules because of a lack of proper living conditions. It is also possible that they died after the use of a disinfectant, which may have fixed them so that, after many years, they could still be observed. I also believe that if a few bacteria are left in the dentinal tubules, and if they reach the pulp tissue, they or their toxins will be destroyed by this tissue. The pulp tissue has all elements capable of fighting bacterial invasion, and its facility for forming secondary dentin helps in walling off an infected or irritating area. The penetration of bacteria or other irritating substances through secondary dentin is greatly hampered because the secondary dentin often obliterates all dentinal tubules of the primary dentin and itself shows many less tubules.

It certainly would be of great value if we could produce secondary dentin in every tooth attacked by caries or in teeth to be used as abutments. It may be recalled that J. P. Buckley[5] presented a desensitizing paste to the profession thirty years ago. This paste, when placed in the cavity, rendered the tooth entirely insensitive to further instrumen-

tation. It was accepted enthusiastically by the profession, but soon reports came in of pulp involvements in the teeth in which it had been used. For about five years, I conducted some experiments on dogs, using formaldehyde in its polymeric form, paraformaldehyde, the main active drug in Buckley's desensitizing paste. This is a powder which slowly liberates formaldehyde by disintegration, and the fact that in Buckley's

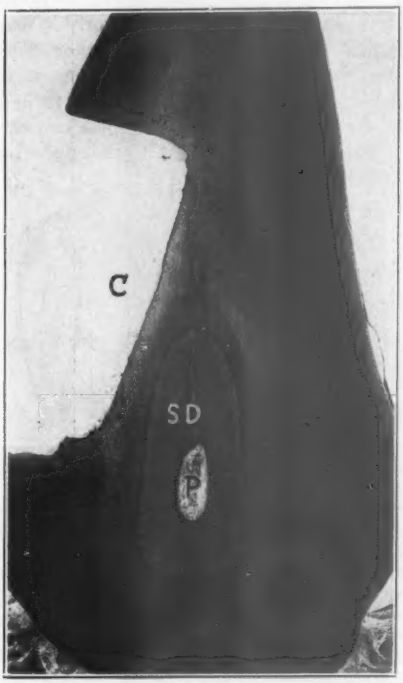

Fig. 4.—Cavity (C) in dog's tooth in which 3 per cent paraformaldehyde had been sealed for nine months. The pulp (P) has retracted and a large amount of secondary dentin (SD) fills almost the entire former pulp chamber.

paste about 30 per cent paraformaldehyde was incorporated was, of course, the main reason for the failures. This paraformaldehyde mixed with zinc oxide in low concentration gave remarkable results in the dog experiments. No other drug could induce secondary dentin formation of the same extent in the dog's pulp.

Figure 4 shows one case wherein this drug, in 3 per cent concentration, had been sealed in a cavity of a dog's tooth. When the tooth was sectioned, nine months later,[4] almost the entire pulp chamber was filled with secondary dentin. Owing to the first action of the drug, some odontoblasts had been destroyed. The remaining areas appear as small spaces surrounded by secondary dentin. Later on, the pulp and the odontoblasts recovered, regular dentinal tubules, also odontoblasts, being present in the pulp. As I carried out these experiments, I came to the conclusion that in 5 to 6 per cent concentration, this paraformaldehyde is a harmless, but

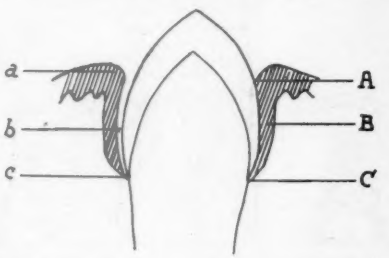

Fig. 5.—Diagram showing old and new conception of attachment of gingivae to tooth. a, free gingivae; b, formerly believed to be gingival crevice; c, gingival line formerly believed to be attachment. A, bottom of gingival crevice; B, epithelial attachment; C, cemento-enamel junction. The capital letters show the new conception.

also a very useful, drug. Experiments on human teeth are now on the way, and I hope in results they will conform with the experience gained by the dog experiments. Clinical observations on the use of this drug mixed with zinc oxide—zinc sulfide compound, which hardens rapidly when mixed with water—gave reason to be hopeful.

I would now like to direct attention to the gingiva, which needs careful consideration in restorative work. It is a well known fact that food impaction be-

tween teeth with poorly fitted fillings or crowns, or between teeth with bad contacts, often does irreparable damage to the interdental papilla. Proper shaping of the fillings or crowns will protect the gum margin from food injuries, while disregard for the important principles of form will lead to pathologic conditions.

There is an important relationship between gum and restorative operations as regards the principles of "extension for prevention" of the gingival margin of a cavity.

It is a generally accepted rule that the gingival margin of a cavity should be extended into the gingival crevice, below the free margin of the gum, because that part of the tooth surface is immune to decay. This requirement of "extension for prevention" was set up by G. V. Black in his work on "Operative Dentistry." There are several exceptions to the rule, and the statement that the tooth surface in the gingival crevice is immune to decay because it is a clean surface is not proved by histopathologic investigations. The requirement of extension for prevention at the gingival margin has been set up on the supposition that the gingival crevice is a clean and, therefore, an immune surface. I do not believe that this is true. New biologic observations regarding the gingival attachment to the surface of the tooth by Gottlieb in 1921 have been neglected in relation to the extension for prevention at the gingival margin.

I cannot enter into a detailed discussion of this subject at this time, but I should like to state the biologic principles involved and to point out the practical conclusions. While formerly it was believed that the gingiva is attached to the tooth at the cemental line, it is known today that the gingiva is attached to the tooth with a band, collar or belt-shaped attachment called the epithelial attachment. (Fig. 5.)

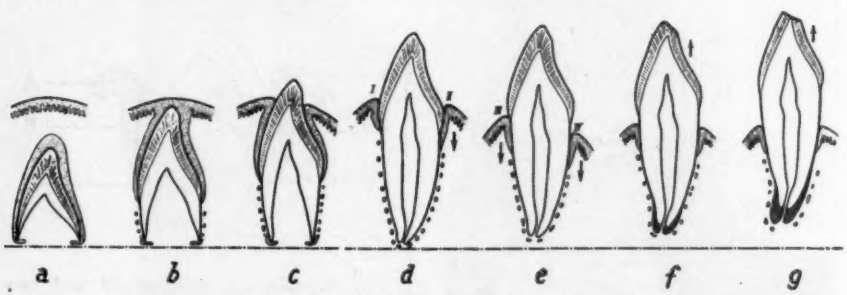

Fig. 6.—Development of epithelial attachment and phases of tooth eruption. a, epithelium covering entire crown. This enamel epithelium is separated from the epithelium of the mucous membrane. The enamel epithelium (b) becomes united with the epithelium of the mucous membrane. The tip of the enamel (c) breaks through the mucous membrane, the epithelium remaining attached to the enamel. d, tooth in occlusion. The epithelial attachment is still on the enamel (I). The epithelium starts to migrate along the cement (II). The epithelium (e) migrates along the cementum, the entire enamel being exposed (III). Migrating of the epithelium continues, exposing parts of the cementum (IV). f and g, continuous migration of epithelium along root surface and tooth erupting actively toward occlusal plane.

G. V. Black's observation that on extracted teeth, gingivally from a carious lesion, the tooth surface is clean, smooth and shiny, corresponds to Gottlieb's findings on the epithelial attachment. Black believed that the surface was clean and shiny because it was covered by the gingival crevice, while today we know that the gingiva was attached to this surface, and that this surface was not yet exposed and therefore it appeared

smooth and clean. This epithelial attachment is the remainder of the epithelium forming the enamel organ (Figure 6), which remains attached to the enamel as the tooth erupts.

This diagram shows the tooth germ in development covered by the enamel epithelium. In the process of eruption, the enamel epithelium unites with the epithelium of the oral mucous membrane, and when the tip of the enamel cuts through the gingiva, the epithelium of the oral mucous membrane can be followed down along the side of the enamel to the cemento-enamel junction. The enamel epithelium is attached to the surface of the tooth and is called the epithelial attachment. In the young, this attachment is on the enamel; in the old, it is on the cementum. Between two extremes are found all transitional stages. This phenomenon shows that the gum is physiologically receding with age. The age limits of the different stages are quite variable. We may find exposed roots in persons of from 20 to 25 years, and the gum attached to the enamel even in relatively advanced age, from 50 to 60 years. However, the continuous shifting of the attachment apically must be recognized as a biologic rule.

Fig. 7.—Longitudinal section through roots of two teeth. The bone lamellae, limiting the periodontal membrane (A), is the true alveolar bone or lamina dura, as seen in the x-ray films. Bone trabeculae between and behind this bone are forming the so-called supporting bone (SB).

From these facts, we conclude that,

if the epithelial attachment is still on the surface of the enamel and the gum margin fills the entire proximal space, the gingival margin of a cavity should be placed under the free margin of the gum, with careful consideration of the gum margin and the epithelial attachment so that there will be no injury. Before the gingival margin of a cavity is finished, the gum should be treated if it is diseased. The cavity margin should be as close to the bottom of the gingival crevice as possible.

If the gum has receded from the enamel, and the gingival papilla does not fill the interproximal space, and if the gingival crevice is very shallow, the gingival margin of a cavity need not necessarily be carried below the free margin of the gum.

The gingival margin of a cavity should be placed far enough away from the contact point, and if the proximal space is narrow, it should be farther than if the space is wide.

The margin of a cavity is extended farther in caries-susceptible individuals.

The gingival margin, as well as all other margins, of cavities are extended more or less according to the mechanical requirements of the restoration, as follows:

If the clinical crown of the tooth is short, the preparation is extended below the free margin of the gum, or even below the bottom of the gingival crevice, separating some of the attachment. If the clinical crown of the tooth is long, and the gum has probably receded, the preparation is not extended too close to the gum. These principles, of course, hold true for the preparation of simple cavities, for three-quarter crowns, full crowns, jacket crowns, etc. If esthetics is to be considered, we may have to alter our plans of preparation. We must be aware of the fact that the epithelial attachment shifts physiologically in an apical direction, and fillings or crown margins placed under the gum at an early age will become exposed with advancing age. Also, from the point of view of the prophylactically minded periodontist, the ideal condition of the

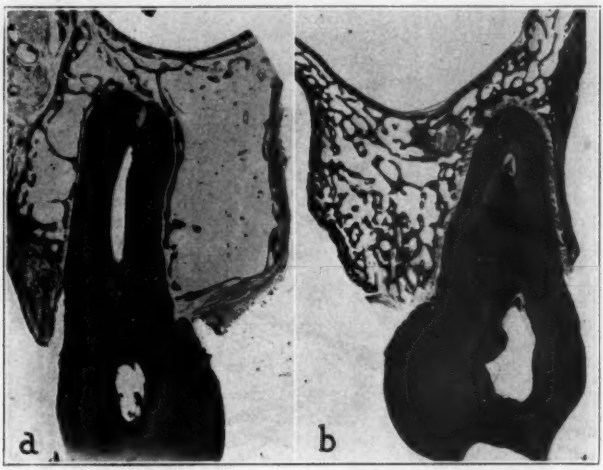

Fig. 8.—Two teeth from same jaw, one in proper occlusal function (b), the other without occlusal function (a). The main difference between these two teeth is that the supporting bone is properly formed in the tooth in function, while it is almost missing in the tooth without function.

gum is realized when the gingival crevice is very shallow, even zero.[5] If there is no crevice, there is no calculus deposit, no irritation, no inflammation and no "pyorrhea." Prevention of recurring decay at the gingival margin will depend more on the complete removal of decay at this margin, proper finishing of this cavity margin and adaptation of the filling at this margin than on the extension of the cavity margin under the gum margin. The rules of extension for prevention should be carefully followed with regard to the buccogingival and linguogingival corners of the cavity so as to place them in self-cleaning or cleanable areas, as required by the rule of Black. They are the most frequent areas of recurring decay.

Admitting the correctness of the observation that the tooth surface covered by the free margin of the gum is immune to decay, we offer an objection to the theory that this area is clean or self-cleaning. The crevice of all places in the mouth is best adapted for collecting all kinds of débris and bacteria in its depths. It is by no means clean in any mouth. The immunity of the crevice might find explanation in the fact that its pH reaction is mostly on the alkaline side owing to continuous fluid seepage in the crevice, preventing the gathering of acid-forming bacteria.[6]

The third tissue to be considered in our daily practice is the periodontal membrane. We can consider it the most vital part of the dentition. A tooth can function without a pulp; the crown portion of the tooth can be replaced, but without an adequate periodontal membrane, no human tooth can exist. The main structures in the periodontal membrane are fibers which connect the tooth not only with the bone, but also with the cementum, which is the connecting medium between fibers and root surface, and the alveolar bone surrounding the root. These three structures, cementum, periodontal membrane and bone, form a functional unit in which the cementum, being directly connected with the tooth, is the most important structure. Every movement of the tooth is transmitted

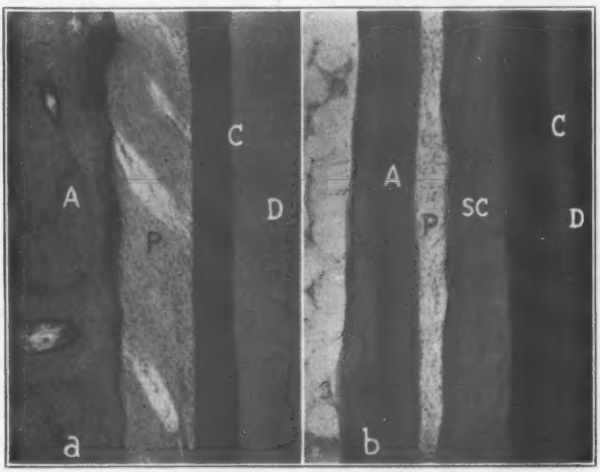

Fig. 9.—Periodontal membrane of two teeth from same jaw, of a tooth (a) in proper occlusal function and of a tooth (b) without function. A, alveolar bone. P, periodontal membrane. C, cementum. SC, secondary cementum. D, dentin. The difference between the functioning and non-functioning tooth is striking.

through the cementum to the fibers of the periodontal membrane and thus to the bone. Every change in the relationship between opposing and neighboring teeth will be recorded in the functional structures of the supporting tissues. A heavier use than usual will lead to changes in the structures, the same as loss of use. Trauma, as well as disuse, will result in changes, the structures being in functional relationship.

Figure 7 is a longitudinal section through the roots of two teeth, showing the periodontal membrane and the bone surrounding the roots. The bone lamella immediately limiting the periodontal membrane is the true alveolar bone, while the bone trabeculae between these lamellae form what we call the supporting bone. The histologic structure of these two bones is the same, but their functional relationship to the teeth is different. The alveolar bone, the servant of the tooth, is present as long as the cementum functions properly; that is, as long as it is vital, and it becomes lost when the cementum is lost. The supporting bone will be built according to the stresses and strains in the jaw bone, and in relation to the occlusal function of the teeth. In Figure 8, we see two upper molar teeth, one of which has been in normal occlusal relationship, the other without an antagonist for years. The tooth in normal occlusal function has a normal periodontal membrane. The cementum is relatively thin and regular all around and the fibers of the periodontal membrane are stretched between cementum and bone, which shows that they are carrying the load. The width of the membrane is normal, permitting slight movement of the tooth. The alveolar bone almost reaches the cementoenamel junction and the supporting bone consists of numerous trabeculae in a honeycomb arrangement. In the tooth without an antagonist, the cementum is considerably wider, but the periodontal membrane is much thinner. The alveolar bone, however, is present and surrounds the root, an indication that in spite of disuse of this tooth, the cementum is functioning properly and needs the alveolar bone. The supporting bone is almost entirely lost because of lack of functional stimulation from the tooth. This is a typical disuse atrophy[7] of the bone—an osteoporosis due to lack of functional stimuli.

In two other figures, I should like to again point out the differences in the structure of the supporting tissues of a used and of a disused tooth in the same dentition. Figure 9,a shows the tooth in occlusal function. The cementum is regular, laid down layer by layer, and shows the fibers of the periodontal membrane incorporated in its structure. The fibers of the periodontal membrane are stretched between tooth and bone in an oblique direction. The spaces between these fiber groups carry the vessels and nerve fibers. The principal fibers of the periodontal membrane are embedded on their other side in the bone, which shows a regular haversian system arrangement with nourishing channels. The periodontal membrane is about twice as wide as the cementum. This picture gives the impression of functional fitness—being able to meet even unexpected demands.

In comparison with this structural arrangement, the disused tooth is quite different, as seen in Figure 9,b. The old cementum is seen as a dark layer covering the dentin. This cementum was built at the time when the tooth was in proper occlusal function. After the loss of this function, new cementum was laid down on the old, but this new cementum is quite different in structure. No layers are seen, laid down one on another, and no fibers are embedded in its mass. The fibers of the periodontal membrane are not stretched between cementum and bone, but lie loosely between these hard substances without any special arrange-

ment. The periodontal space is about one-third as wide as that of the normal tooth, the cementum taking the other two-thirds. The bone is also quite different from that of the functioning tooth. The bone lamellae run parallel with the tooth surface and show no fibers embedded in their structure. The entire picture gives the impression of functional unpreparedness to meet emergency requirements. This is the main point that I should like to discuss in the practical conclusions to be drawn.

Should a tooth that has been without an antagonist for a long time be called upon to take part in the work of chewing again, the periodontal membrane faces a structural unpreparedness. This is the reason that at times, when fillings and fixed or removable appliances are placed, the patient complains of pain. A tooth may feel lame and weak for many weeks or months if the new functional requirements are different from those present before the restoration was made. In time, however, if the tissue reaction is favorable, we can expect complete functional rearrangement of the periodontal membrane, cementum and bone, according to the new requirements. The supporting bone will of course also react to the new stimuli, and new trabeculae will be built and the old ones will become thicker.

In discussing the biologic factors in restorative dentistry with regard to the periodontal membrane, traumatic occlusion would be one of the main subjects of discussion. However, I shall limit myself to a few basic remarks. I recently published a paper[8] on traumatic occlusion. This subject also was treated extensively in the book written in cooperation with Gottlieb.[9] As we discussed the biologic aspects quite broadly, it is, I believe, not necessary at this time to enter into this phase of the problem.

In all discussions on traumatic occlusion, cusp interference, raising the bite, etc., it should be kept in mind that the supporting structures of the teeth are built to withstand much force and load if applied along the long axis of the teeth. The fibers of the periodontal membrane are very strong. The cementum will often tear easier from the surface of the dentin than the fibers themselves. The bone can withstand much force applied as a pulling force, but will yield to resorption if exposed to pressure, even very slight pressure. Therefore, we should design our restorations, simple fillings, bridges or bite-raising appliances so as to eliminate all possible side movement of the teeth, directing the occlusal forces along the long axis of the teeth.

I am aware of the fact that my presentation will leave many vital questions open, not only for discussion, but also for investigation. My intention has been to point out some of the biologic factors in restorative operations. There are many biologic factors that should be more closely observed in restorative dentistry. In fact, there are many problems which have not yet been solved to our satisfaction.

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ULCERS OF THE TONGUE

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ULCERS of the tongue (lingual ulcers), the commonest lesion found on this organ, may be harmless or may result in the death of the patient.

Lingual ulcers may be classified as follows: 1. Non-infectious ulcers of the tongue. 2. Infectious ulcers of the tongue. 3. Malignant ulcers of the tongue.

Non-infectious ulcers of the tongue are known as septic or aphthous ulcers. The lesions may be of almost any size. They usually are small and circular, but may be irregular in shape with fissured borders. Septic ulcers of the tongue present a smooth red glazed surface with slightly hardened edges, and may be very painful.

Septic ulcers are the result of irritation from sharp edges of jagged teeth, improperly inserted fillings or poorly constructed dental appliances. They occur in digestive disturbances and are known as canker sores. They may also be found on the gingiva and on the buccal mucosa. Septic ulcers are seen in all kinds of chronic superficial glossitis. A history of irritation will suggest the cause. The ulcer usually lasts about two weeks.

The lingual ulcer is to be distinguished from syphilitic, tuberculous and carcinomatous ulcers of the tongue.

Aphthous ulcers are amenable to treatment, but may recur. Sometimes, they persist for an indefinite period with little change. If this is the case, and it applies to all cases of chronic ulcerations irrespective of location, they should be regarded with suspicion when present in persons who have reached the cancer age and should not be allowed to persist indefinitely.

The lingual ulcer is amenable to local daily treatment with a 2 per cent solution of chromic acid or silver nitrate. The very painful chronic ulcers may be incised.

Infectious ulcers of the tongue are due to the presence of specific micro-organisms. Two typical infectious ulcers of the tongue are the syphilitic and the tuberculous ulcer.

The tuberculous ulcer of the tongue or tuberculous glossitis is an infectious disease of the tongue due to the presence of the tubercle bacillus.

Tuberculous lesions occur on all surfaces of the tongue. They are most often found upon or near the tip and on the dorsum of the tongue. The affection starts as small, painless, yellowish nodules that vary in diameter from 1 to 5 mm. and may grow in size to 1 cm. The mucosa becomes indurated and soon ulcerates. These ulcers have a dark red border and undermined edges. At first, they are indolent and painless. Later, they become more and more painful. In some cases, the tongue is rapidly destroyed. The tongue is coated and dry. The lymphatic glands are not enlarged. Salivation is a marked symptom.

Tuberculosis of the tongue occurs rarely and is nearly always secondary to an infection of the respiratory tract. Cecil states that tuberculous ulceration of the tongue occurs in less than one per cent of all pulmonary cases.

The clinical symptoms, plus the results of a microscopic examination of the lesion or inoculation of guinea-pigs with an emulsion made from the diseased tissue, will confirm the diagnosis. In all suspected cases of lingual or oral tuberculosis, the patient should be given a thorough physical examination and

roentgenograms of the lungs should be taken.

Tuberculous glossitis may be confused with syphilitic glossitis (especially the gumma), carcinomatous ulcer and the so-called septic ulcer. The tuberculous ulcer differs from the above-named in being more painful. It occurs at the side of the tongue and has undermined edges.

Tuberculous ulcer may be differentiated from septic ulcer as follows: The former appears on all surfaces, has undermined edges, occurs at or before puberty and gives a history of secondary infection. The latter appears at the side of the tongue, has sloping edges, occurs at any time and gives a history, perhaps, of chronic irritation.

The prognosis is grave, if progress is not checked. Death results in a few months or at the end of a year or two.

The treatment consists in the destruction of the lesion by curetting, the use of x-rays, the application of lactic acid, excision or use of the Finsen light.

Syphilitic ulcer of the tongue or syphilitic glossitis is a chronic systemic infectious disease due to *Spirochaeta pallida.*

The syphilitic ulcer of the tongue is usually the gumma, the characteristic lesion of tertiary syphilis. The gumma first appears singly as a smooth, shiny red or purplish plaque which is very firm. Other plaques may occur, and they tend to coalesce and break down to form ulcers. This lesion is a painless ulcer, which may be superficial or deep-seated. It is usually situated in the midline of the dorsum of the tongue. Glandular involvement may occur.

The diagnosis can readily be made by use of the various complement fixation tests or by demonstrating the presence of the causative agent, which is *Spirochaeta pallida,* in smears made from the lesion. Cancerous degeneration of a syphilitic gumma is quite a common occurrence.

As already stated, syphilitic ulcer of the tongue may be confounded with tuberculous ulcer, carcinomatous ulcer or so-called septic ulcer.

The differentiation from tuberculous ulcer of the tongue is as follows: The syphilitic ulcer appears in middle or early life, occurs on the midline of the dorsum and has a punched out appearance and the lymph glands are swollen. The tuberculous ulcer appears in childhood or youth, occurs on all surfaces and has undermined edges, and the lymph glands are not swollen.

Carcinomatous ulcer of the tongue develops much later in life and appears on all surfaces of the tongue, and the lesion is characterized by everted edges and hardness. Pain is often referred to the ear.

In aphthous ulcer, the lesion is usually situated at the tip of the tongue and has sloping edges. It appears at any age and is very painful.

Drugs that have been satisfactorily employed in the treatment of this disease are: compounds of arsphenamine, bismuth, mercury and potassium iodide.

The malignant ulcers of the tongue are known as carcinomatous ulcer, carcinoma or cancer.

Carcinomatous ulcer of the tongue is a malignant epithelial tumor. The initial lesion appears as a blister, a warty growth, a fissure or an excoriation. It soon ulcerates. The pain is often quite severe and is often reflected to the ear. The lymphatic glands of the neck soon become enlarged. The lesions are most commonly situated on the tip of the tongue along the lateral borders, in the base of the tongue posterior to the *sulcus terminalis,* on the anterior two-thirds of the tongue and also on the inferior surface. Cancer of the tip of the tongue will involve the submental nodes and cancer of the border of the tongue will affect the submaxillary nodes. Other symptoms that may be present are: throat irritation, cough,

dyspnea, dysphagia, fatigue of the voice and painful deglutition if the growth is well back on the tongue. There is increased salivation and fetor of the breath.

The cause of cancer is obscure. The most frequent excitant is continuous or frequently repeated irritation from sharp or jagged teeth or poorly constructed or ill-fitting dental appliances. Lingual carcinoma usually follows leukoplakia, pyorrhea, septic oral infections and the use of tobacco. Three per cent of cancers of all kinds are lingual and the mortality for oral cancer is very high, forty-five hundred persons dying annually in this country from this affection. Lingual ulcers occur in elderly persons, ranging in ages from 42 to 80, but it must be kept in mind that this affection may occur in younger persons. A few cases have been recorded in which the age was in the twenties. They are more frequently seen in men than in women. In most countries, 90 per cent of oral cancers occur in men. The exception to this is Sweden, in which 70 per cent of oral cancers occur in women. This has been explained by the fact that, in certain parts of that country, the women are pipe smokers.

The growth at first develops slowly, does not yield to treatment and fails to show any signs of spontaneous healing. Its development becomes more rapid, and it becomes indurated and then ulcerates. This is one of the earliest objective signs of cancer. Pain may occur even before there are recognizable objective signs. Next, there will be progressive growth, ulceration, hemorrhage, salivation and enlargement of the lymph nodes. Involvement of the lymph nodes in the necks of patients undergoing treatment for lingual cancer occurs in about 30 per cent of all cases. A biopsy will confirm the diagnosis. Another fact to keep in mind is that if the ulcerating lesion is of more than two or three weeks' duration, malignancy should be suspected.

The age of the patient, the occurrence of ulceration, the general appearance of the growth and the course will usually enable one to distinguish lingual carcinoma from other affections that may bear a close resemblance to it. In the differential diagnosis, one must not rule out oral cancer because of the youth of the patient; for when it does occur, it proves fatal.

Carcinomatous ulcer of the tongue must not be confused with the so-called septic ulcer, the tuberculous ulcer or the syphilitic ulcer.

The prognosis for carcinomatous ulcer of the tongue is grave. There are no cures. Death is usually due to cachexia, metastasis or intercurrent infection.

In treating oral cancer, the first thing that must be done is to remove all nonvital infected and broken down teeth. All sharp edges of poorly placed fillings must be polished and all poorly constructed or ill-fitting prostheses must be removed. Finally, a thorough prophylaxis must be given.

The only means of curing oral cancer is early recognition of the growth, and removal or destruction of the growth. Most surgeons regard excision as the best, if not the exclusive, course to pursue. Electrocoagulation and electrosurgery are of great value in treating this affection. The use of the x-rays, carbon dioxide snow and radium has given gratifying results.

CONCLUSION

It seems that the only means of prevention lies with the dentist. He must be capable of recognizing these lesions and those conditions that produce them, as he is probably the first one to see them. The dentist also must be able to differentiate these lesions and aid in the diagnosis.

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EFFECT OF MAGNESIUM DEFICIENT DIETS ON ORAL AND DENTAL TISSUES

II. CHANGES IN THE ENAMEL STRUCTURE

By HERMANN BECKS, Dr. med., Dr. med. dent., D.D.S., and
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INTRODUCTION

THE effects of magnesium deficient diets on bodily function and specific tissue cells in experimental animals have been reported by Cramer,[1] Greenberg, Lucia and Tufts,[2] Tufts and Greenberg,[3] Lavollay,[4] Kruse, Orent and McCollum,[5] Sugiura and Benedict,[6] Klein, Orent and McCollum[7] and Watchorn and McCance.[8] The results demonstrated that magnesium is essential for the normal growth and maintenance of experimental animals. A review of this subject has been presented by McCollum, Orent-Keiles and Day[9] in their textbook on nutrition.

Deficiencies of enamel structure resulting from developmental disturbances have been frequently observed in animal experimentation. Formerly, it was believed that enamel hypoplasia was solely the result of a dietary scarcity of calcium. In fact, for many years, hypoplastic areas of enamel were regarded as entirely of rachitic origin. Gottlieb,[10] in 1922, formulated a new concept of the etiology of enamel hypoplasia, believing it to be due to delayed or faulty calcification of the enamel matrix, which finally collapsed and became detached from the tooth surface. The frequent observation of folds was used by Gottlieb to support his viewpoint. According to his concept, ameloblasts ceased to function only after their separation from the enamel surface, which meant that the degeneration of the ameloblasts was of secondary nature.

This viewpoint is not in accord with those expressed by Bauer,[11] Becks,[12] Klein[13] and others, who believe that enamel hypoplasia can result from early primary degeneration of the enamel organ due to dietary or hormonal deficiencies of varying nature. One of us (H. B.) demonstrated that such degenerative changes result in rats from the rachitogenic diet No. 3143 (McCollum) and in guinea-pigs on diets deficient in vitamin C, which were normal or high with regard to the calcium content. In most instances, the enamel epithelium was not separated from the tooth surface at all, but showed localized primary degenerative changes.

It is now known that the etiologic factors in enamel hypoplasia are manifold, including severe vitamin and mineral deficiency, endocrine dysfunction and general infectious disease. A review of experimental results has been given by Schour.[14] In the incisors of fourteen young rats, the progressive degeneration of the enamel epithelium resulting from magnesium deprivation was described in a previous report,[15] and it was to be expected that changes in the enamel struc-

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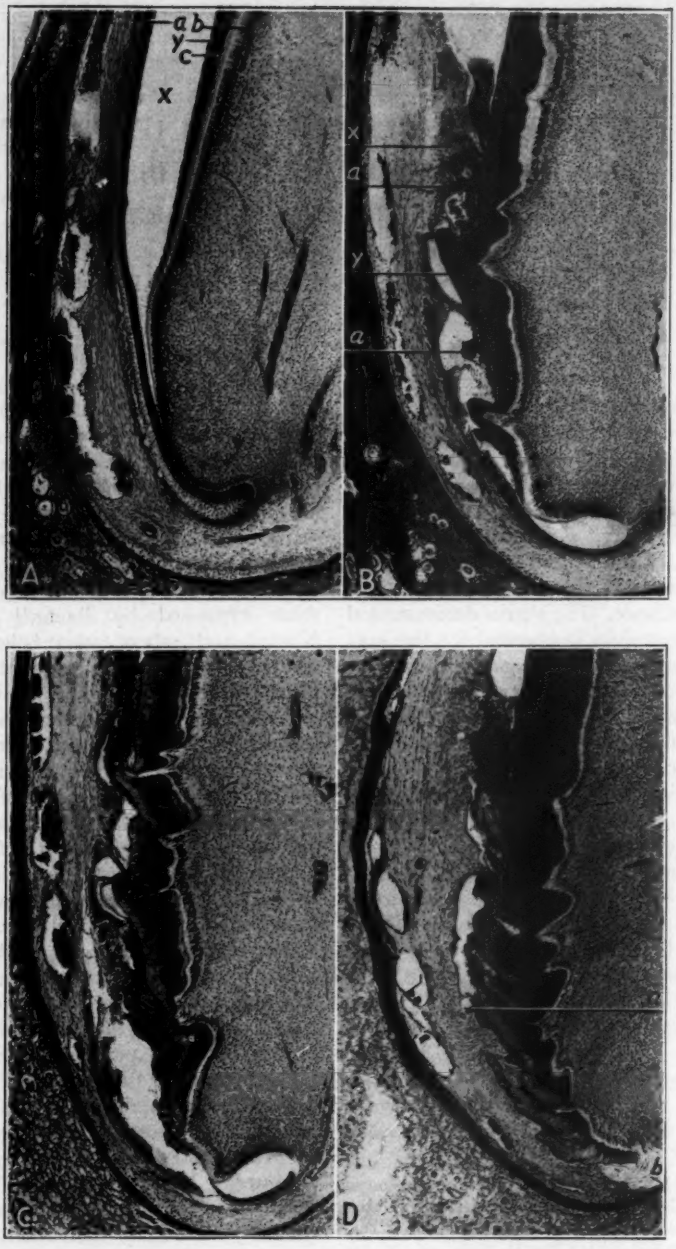

Fig. 1.—Comparative sections of labial side of anterior teeth of rats, near apex, showing enamel hypoplasia as result of dietary magnesium deficiency. A, control animal, 150 days old (spec. 3069): a, ameloblasts; b, odontoblasts; c, dentin; x, space formerly occupied by enamel, and y, enamel. B, animal fórty-one days on magnesium-deficient diet, 69 days old (spec. 4014): a, enamel hypoplasia; x, degenerated ameloblasts; y, area of active enamel formation. C, animal eighty-four days on magnesium-deficient diet, 112 days old (spec. 4022). D, animal 186 days on magnesium-deficient diet, 214 days old (spec. 4000). (Embedded in parlodion; stained with hematoxylin-eosin; Leitz apochromatic 1 b; eyepiece 8x; extension of camera 22 inches; x 74.8.)

ture would accompany these lesions. The diet, employed by Tufts and Greenberg,[8] consisted of washed casein, fat, sucrose, vitamin supplement and purified salt mixture and, on analysis, was found to contain thirteen parts of magnesium per million parts of food. Detailed information on experimental data is given by Tufts, Greenberg[16] and the authors.[17] The present communication deals with the enamel changes.

CHANGES IN THE ENAMEL STRUCTURE

Incisors.—For the purpose of demonstrating the various changes in the enamel structure that resulted from a magnesium-deficient diet, four animals were selected which were 150 (control), sixty-nine, 112 and 214 days on the experimental régime at the time of necropsy. (The animals on the régime 150 and 112 days were added to the original group after the appearance of the first publication.[15] The magnesium deficient and control diets are identical in composition with the respective ones of the previously reported group.)

Because of the fact that the anterior teeth grow continuously, the disturbances in the enamel epithelium, as well as enamel structure, manifest themselves first in the region of the apical third, where the differentiation from embryonic into highly specific tissue cells takes place.

Figure 1A presents the labial side of the apical third of an anterior tooth of a control animal. Figures 1B, 1C and 1D are photographs of the same areas in animals that had been on the magnesium-deficient diet for forty-one, eighty-four and 186 days, respectively. These four

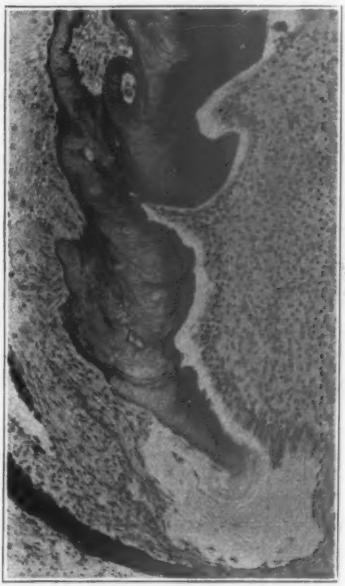

Fig. 2.—Higher magnification of a-b, Fig. 1 D; complete disappearance of ameloblastic layer at apex. (Embedded in parlodion; stained with hematoxylin-eosin; Leitz apochromatic 16 mm; eyepiece 8x; extension of camera 23 inches; x 220.)

Fig. 3.—Higher magnification of area incisally from a, Figure 1 D; severe degenerative changes in the ameloblastic layer and folding of dentin. (Embedded in parlodion; stained with hematoxylin-eosin; Leitz apochromatic 16 mm; eyepiece 8x; extension of camera 20.5 inches; x 215.)

photomicrographs are of the same magnification.

Figure 1A shows, in a normal growing animal, the arrangement of the ameloblasts (a) and odontoblasts (b) and their respective products. Area x of the enamel (y) was lost during the process of decalcification. Usually, after twenty days on the magnesium-deficient diet, most animals showed degenerative changes in the enamel epithelium, accompanied by enamel hypoplasia, and this was observed in all experimental animals after forty-one days (Fig. 1B). The ameloblastic layer is distorted and shows marked signs of degeneration at several places (x). In the areas where the ameloblasts have retained their normal appearance, enamel formation has continued

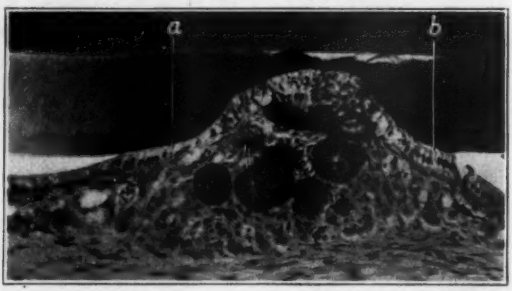

Fig. 4.—Severe enamel hypoplasia in animal forty-one days on deficient diet (spec. 4014). (Embedded in parlodion; stained with hematoxylin-eosin; Leitz apochromatic 16 mm; eyepiece 8x; extension of camera 30 inches; x 290.)

(y), as indicated by the presence of basophilic enameloid. In many instances, where the enamel epithelium had suffered to a large extent, attempted activities of surviving ameloblasts resulted in deposits of enamel pearls and other irregularly calcified substances (a).

After eighty-four days on a magnesium-deficient diet (Fig. 1C), the disturbance observed in Figure 1B is not only repeated, but also is increased in severity. The distortion of the ameloblastic layer in the degenerating areas is more pronounced and extends farther incisally. The dentin shows severe folds. The latter reaction has also been observed by Schour and Van Dyke[18] in the incisors of hypophysectomized rats and was stated to be the result of a disproportion in eruption time and dentin formation. Further discussion of these folds in the dentin will be reported separately. Measurements of the eruption time of the anterior teeth during the experimental period were not made.

The most extreme changes in the enamel resulting from the magnesium deficiency is shown in an animal which remained on the deficient diet for 186 days (Fig. 1D). Enamel formation is markedly disturbed throughout the entire apical third of the tooth, with a complete cessation of ameloblastic activity near the apex (a-b). It can be noted that the ameloblasts are absent in this area and the connective tissue is in direct contact with the dentin. It appears, therefore, that the lack of magnesium in the diet has a direct and significant effect on epithelial tissue, resulting, in its extreme form, in complete cessation of enamel formation.

Figure 2, a higher magnification of area a to b, Figure 1D, shows the direct contact of dentin with the connective tissue. Farther incisally (Fig. 3), remnants of the severely degenerated enamel epithelium can still be seen (x). The folding of the dentin (observed in Fig-

ures 1B and 1C) is intensified and extends farther toward the incisal edge. It can be noted that the dentin layer on the outside is less calcified than the center portion.

A typical area of enamel hypoplasia is demonstrated in Figure 4. The ameloblasts have lost their characteristic appearance in the area from a to b, while incisally and apically their normal structure can still be seen. The degenerating enamel epithelium is in direct contact with the surface of the enamel, which is very thin in this area, with the formation of numerous enamel pearls. There is no indication of a folding of the enamel epithelium or severance from the enamel surface, which, according to Gottlieb, is a prerequisite for the formation of enamel hypoplasia.

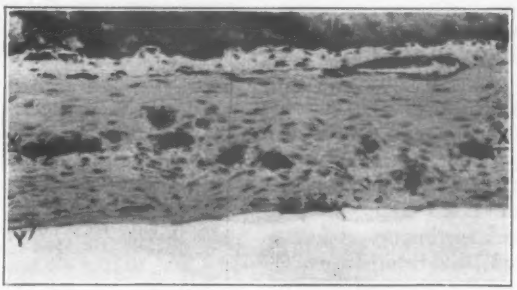

Fig. 5.—Calcified deposits in subepithelial connective tissue near alveolar crest of animal on deficient diet for 186 days (spec. 4000). (Embedded in parlodion; stained with hematoxylin-eosin; Leitz apochromatic 16 mm; eyepiece 8x; extension of camera 23 inches; x 220.)

In the incisal extremity (Fig. 5), large dark staining amorphous calcified concretions (x) are found in the subepithelial connective tissue, with an apparently normal enamel structure. The ameloblastic layer is reduced to a very fine line (y).

Molars.—In the rat, the first and second molars erupt at about the nineteenth and twenty-first days, respectively, and the third molar appears about the thirty-fifth day. Since most animals were started on the magnesium-deficient diet when they were about twenty-eight days old, no outstanding changes in the enamel structure were found in the molar teeth of these animals. However, a brief comment may be made on the appearance of the soft tissues of the oral cavity and of the macroscopic appearance of these teeth. In teeth of animals remaining on the experimental diet for forty-one and eighty-four days, the gum tissue surrounding the anterior and molar teeth was free from any indication of abnormality. In the animal that survived the deficiency for 186 days, a slight hypertrophy of the gingiva was noted. The findings of Klein, Orent and McCollum,[7] who reported marked swelling of the gingiva in their animals after ninety days of deprivation, could not be confirmed. It must be recalled, however, that the magnesium content of their diets was much lower (1.8 parts magnesium per million parts of food) than that used by Tufts and Greenberg.

No decay was noted in any of the molar teeth, even after an experimental period of 186 days.

COMMENT AND CONCLUSION

In the anterior teeth of young, growing rats on diets containing thirteen parts of magnesium per million parts of food, the ameloblasts on the labial side near the apex showed various stages of localized degeneration, with subsequent form-

ation of enamel hypoplasia. The hypoplastic areas increased in size and number with the duration of the experiment. In some animals, they occurred first after twenty days of magnesium deprivation and they were regularly found in all animals after forty-one days. When the experimental period was extended to 186 days, enamel formation at the apex ceased completely in the absence of an ameloblastic layer and the connective tissue was found in direct contact with the surface of the dentin. In the incisal portion, particles of amorphous chromatophilic deposits were found in the subepithelial connective tissue. The "reduced enamel epithelium," found normally in this region, was replaced by an acellular structure.

No changes were noted in the molar teeth of these animals because the enamel formation was completed before the onset of the dietary disturbance. No carious areas were found in the molar teeth.

It can be generally concluded that magnesium is an essential mineral for enamel formation in rats and that its lack represents another important factor to be considered in disturbances of enamel formation.

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PRACTICAL NUTRITIONAL SUGGESTIONS FOR DENTISTS

By Percy R. Howe, D.D.S.; Otto A. Bessey, Ph.D., and Ruth L. White, B.S., Boston, Mass.

A PAPER on practical nutritional suggestions for dentists prepared at the Forsyth Dental Infirmary in 1930 was subsequently published in The Journal.[1] Although an immense amount of research on mineral metabolism as related to tooth and bone formation has been carried on since that period, it has disclosed very little change in the principles previously set forth. The chemical nature of the vitamins has become clearer, and some have been synthesized; the differentiation of groups of vitamins into their component parts has progressed; increasing light has been thrown on the means by which these food factors function and on the pathology of deficiencies, but no drastic change in fundamental concepts has occurred. Our enlarged experience with the clinical application of these principles, extending over nearly ten years, together with repeated group examinations, justifies their reaffirmation.

The dentist is concerned with problems of growth, development and maintenance of calcified tissue, processes which extend from intra-uterine life to old age. Most important are the fetal period, infancy, childhood and adolescence. So far as studies on calcified tissue have gone, they relate for the most part to mineral and vitamin problems, not alone the question of amounts, but also that of absorption, transport and fixation. It has become apparent that single food factors should be considered in relation to other food factors and to such bodily conditions as rate of growth, time of life, emotional state and functional activity at large.

The dental effects so far experimentally produced have been brought about chiefly by deficiencies in the inorganic elements calcium and phosphorus, and the vitamins A, C and D. Clinical experience seems to verify these findings. Although distinct disease of the gingival tissues has recently been shown to follow certain deficiencies of the vitamin B group, the knowledge in this field at the present time is not sufficiently developed to be of practical value to the dentist.

Since the inorganic content of both teeth and bones consists so largely of calcium, in the form of phosphate and carbonate, this mineral becomes a matter for first consideration. The conclusions of students of nutrition, notably Sherman,[2] and the findings of a recent comprehensive family survey[3] indicate that calcium is one of the elements in which American dietaries are most likely to be deficient. A daily intake of 1 gm. is considered adequate in childhood under ordinary circumstances and normal rate of growth. It is estimated that the average adult needs approximately 0.75 gm. a day, and the pregnant woman or nursing mother about 1.5 gm.

Milk is the factor of safety with respect to calcium. Adequate intake of the mineral is assured by the daily inclusion of 1 pint of milk in the diet of the average adult, and 1 quart during childhood, adolescence and pregnancy. One and one-half quarts is the desirable

amount in lactation. In the main, the calcium in fruits and vegetables is not so well utilized as is that in milk, but these foods make substantial contributions to the total supply of this mineral.

The question is often asked whether calcium fed directly in inorganic form is utilized. Apparently it is, for, in its passage through the digestive tract, it is converted into a soluble form. However, it seems better for the dentist to recommend the use of foods containing calcium than to rely upon concentrates. Natural foods contain many adjuncts, known and unknown, that improve mineral metabolism and unquestionably possess properties making for the most efficient utilization of calcium. Furthermore, foods themselves are the most economical sources of these essential elements.

In addition to adequate consumption of calcium, proper absorption and retention are necessary for the formation of sound bones and teeth. Normal processes in the intestine must be maintained for efficient calcium absorption. Defective absorption occurs in such conditions as chronic diarrhea, excessive catharsis, intestinal infection and faulty liver function. For optimum retention, the structures that are undergoing calcification must be maintained in healthy condition, a state which depends on the welfare of the entire organism. Nutritional integrity, in turn, is a vital part of this general health.

In the selection of foods that will bring about or maintain the most desirable conditions during formation of the teeth, the acid-base relationship deserves consideration. In general, the ash of meats and cereals is acidic, while that of milk, fruits and vegetables is basic. If a diet contains barely enough calcium to meet the body needs, and foods with a predominately acid ash are given, a valuable portion of this calcium is diverted from its normal purpose to neutralize the acid. In carnivorous animals, increase in the acid content of food is offset by the formation of ammonia. In vegetarian animals, nearly 45 per cent of the basic elements of the foods is used to meet acid excess. In primates and in human beings, it is estimated that about 5 per cent of the bases of the body, including calcium, is used for this purpose; all of which means that a preponderance of milk, fruits and vegetables should be given in any mixed diets, in order not only to furnish calcium but also to assist in its efficient utilization by the presence of an excess of the other basic elements.

The rôle of the endocrine system in nutritional irregularities has been the subject of a vast amount of study. In the metabolism of calcium, the parathyroid glands exert a mobilizing influence. Because this fact is so commonly mentioned in the literature, it is interesting to note that, while undue activity of this gland may result in raising the calcium content of the blood, this rise is brought about at the expense of the bones and probably the teeth, at least during the formative stage. Also, considerable attention is now being given to the thyroid and pituitary glands in connection with calcium metabolism. However, these matters are still in the early stages of investigation. No doubt there are many causes for endocrine dysfunction. It may be significant that in our experimental studies of animals maintained on diets deficient in minerals and vitamins, endocrine disturbances frequently occur. Obviously, the practical regulation of disorders of this nature lies in the hands of the physician, but the facts indicate that the stability of endocrine function may depend to a considerable degree on nutritional adequacy.

In general, studies of phosphorus consumption in the United States lead to the conclusion that there is comparatively little danger of a deficiency of this element, which has a more general distribution in foods than has calcium. The

standards recommended above for the consumption of milk safeguard the intake of phosphorus as well as that of calcium.

While other elements, notably magnesium and perhaps sodium, appear to enter into the structure of calcified tissues, nutritional deficiencies in these elements are not of any great moment as far as matters are now understood. It has been well established that the drinking of water containing one part per million or more of fluorides will result in mottled enamel in a forming tooth.[4] In addition, recent epidemiologic studies have indicated that susceptibility to caries may be lower than average in such regions.[5, 6] Although there is some experimental evidence in support of this view, any definite conclusions at this time would seem premature. In the meantime, it is important to keep in mind that there are dangers involved in the use of fluorides to prevent caries. The superior dentition of people whose drinking water is rich in inorganic elements has been noted by numerous observers.

It is well understood that vitamins play a definite part in the formation of bones and teeth, and in the maintenance of the integrity of these structures. Three vitamins, A, C and D, have repeatedly been shown to exert a profound effect on the formation of calcified structures.

Vitamin A deficiency results in the metaplasia of normal epithelium to keratinizing desquamating epithelium. In general, other cell growth is retarded. In the tooth, the formation of enamel ceases, and the odontoblasts, secondarily influenced, revert to the bone-forming state, with erratic calcific formation in the pulp. Striking deformities of the tooth take place because of the diminished formation of sound dentin or the formation of defective dentin.[7] In fact, vitamin A deficiency, during the formation of human teeth, is thought to outrank all other vitamin deficiencies in importance. The significance of this vitamin in early life is thus clearly apparent. Cod-liver oil, which the physician routinely prescribes shortly after birth, helps to supply the infant with this vitamin. The vitamin A reserves of children and adults are maintained by the regular inclusion of liberal amounts of whole milk, eggs, butter and leafy green and yellow vegetables. Pregnant women and nursing mothers must rely heavily upon these foods to meet their augmented need for the vitamin.

In vitamin C (ascorbic acid) deficiency, the bones and teeth are markedly affected. The general effect of the deficiency is exerted on the cells of connective tissues, which become unable to produce normal intercellular substances.[8] In a developing tooth, the odontoblasts either cease to form dentin or form dentin of inferior quality. When the missing factor is supplied, the normal formation of sound dentin is promptly resumed. The bone-forming cells, or osteoblasts, react in the same manner. After the teeth are fully developed, an ascorbic acid deficiency may be responsible for a weakening of supporting structures, both hard and soft. While not the sole cause of conditions of a pyorrhetic nature, the lack of vitamin C often renders bone and connective tissue incapable of withstanding functional stress.[9]

The physician supplements the infant's diet in vitamin C by the introduction of orange or tomato juice during the first month after birth. Care should be taken to insure adequate intake of this vitamin throughout life. In clinical research at the Forsyth Dental Infirmary,[10] an optimum ascorbic acid blood level was found to be maintained in healthy children between the ages of 4 and 10 years on a regular daily intake of 3 ounces of orange or grapefruit juice or 6 ounces of tomato juice (or the equivalent in whole fruits). This work further indi-

cates that citrus fruits are almost indispensable for optimum ascorbic acid nutrition. Other sources, such as potatoes and vegetables, raw and cooked, contributed to a sufficient degree to prevent scurvy, but the quantity of these foods habitually consumed was insufficient to maintain the ascorbic acid level in the blood within the desired range.

Four ounces of orange or grapefruit juice is often the amount suggested for the average older child or adult who is in normal health. During the reproductive cycle, this amount should probably be doubled. There is some indication that the amount of ascorbic acid supplied by 8 ounces of citrus fruit juice is also beneficial in old age. Individual differences and alterations in the physical state often substantially increase the need for vitamin C, making amounts in excess of the foregoing desirable.[11] In pulmonary tuberculosis, for example, the requirement seems to be materially higher. It is possible that infectious diseases have a less disastrous effect on the teeth when the ascorbic acid intake has habitually been generous. So far as is known, there is no danger from excess: the peril lies in deficiency. In practice, the most insidious effects are brought about by deficiencies of a latent and protracted nature.

Rickets is characterized by pathologists as a failure of calcific tissues (bone and dentin) to become normally calcified. This leads to weakness of these structures, which often results in distortion and fracture. The details of the manner in which vitamin D functions to prevent rickets are still obscure. However, it is clear that its net effect is to increase the efficiency of utilization of calcium and phosphorus, probably by improving their absorption by the intestines. A number of conditions may influence calcium metabolism, such as the ratio of calcium to phosphorus in the diet and the general conditions in the intestinal tract. From a dietary standpoint, however, the most important considerations are an adequate supply of calcium and phosphorus and enough vitamin D to insure efficient utilization.

It is interesting to note that, as in experimental scurvy, rachitic alterations in such animals as the guinea-pig occur in the teeth before they do in the growing long bones. Changes in the teeth in human rickets are most profound during the formative stages.

Unlike the other known vitamins, vitamin D cannot be obtained in adequate amounts from naturally potent food sources, but must be supplied by accessory agents. Pediatric practice customarily recommends the administration of some source of vitamin D during the reproductive period, and from early infancy throughout the years of rapid growth. In the absence of specific directions from the physician, a standardized brand of cod-liver oil is considered preferable to concentrates. Sunlight acting on the skin has the same effect as does the intake of vitamin D in concentrated form. However, since the amount of the vitamin so obtained depends on the length of time and extent of exposure, as well as the quality and intensity of light, this method is not reliable unless used under reliable directions.

The question as to whether adults should receive an accessory source of vitamin D is often raised. Although the demands are lower in maturity than during childhood and adolescence, it seems probable that a supplement is advantageous, especially if the incidence of dental caries is high, and during pregnancy and lactation. Under no circumstances should vitamin-D therapy replace emphasis on the ingestion of adequate amounts of calcium and phosphorus.

The mineral and vitamin content of fruits and vegetables in their original state is determined largely by such factors as weather conditions, the quality of the soil and the stage of maturity of the

product. Food values further depend on the processes undergone between production and purchase. In general, modern canning methods result in the satisfactory retention of vitamin content, and the freezing process itself seems to have no destructive action. Long-continued storage, on the other hand, is detrimental, especially to the preservation of vitamin C. The treatment of foods in the home should be so conducted as to foster the retention of vital elements. Fruits and vegetables painstakingly selected for their freshness should often be served raw. If chopped or shredded for salads, they should be prepared as near meal time as possible. Short-time cooking at high temperature is less destructive than the longer and slower application of heat. It is advisable to cook in as little water as possible, and to serve this water with the vegetable or in soups or sauces. Soda should not be added to vegetables while cooking because of the loss of vitamins due to heat in the presence of alkalis. The water in which vegetables have been canned and dried products have been soaked should not be discarded.

The elements most directly concerned with the construction and maintenance of sound teeth have now been briefly discussed. While primary attention may be directed toward them, it must be recognized that requirements likewise exist for calories, protein, iron, copper, iodine, traces of certain other mineral elements and the various components of the vitamin-B complex. Although not directly related to the dental structures, these factors are important because sound teeth can be built and maintained only in a well-nourished organism. Information about the functions and requirements of these dietary constituents may be found in recognized textbooks on nutrition.[2, 12, 13]

Emphasis upon certain foods as the nucleus of the daily diet is a practical means of improving consumption habits and insuring an adequate intake of the essential factors previously discussed. A list such as that in the accompanying

DESIRABLE BASIS FOR DAILY FOOD PLAN

Food	Child (Preschool Period Through Adolescence)	Adult	Pregnant Women and Nursing Mothers
Milk	1 quart	1 pint	1 quart in pregnancy 1½ quarts in lactation
Citrus fruit (orange, grapefruit or tomato, raw or canned)	1 serving or 3-4 ounces juice	1 serving or 4 ounces juice	2 servings or 8 ounces juice
Other fruit, fresh, canned or dried	1 serving	1 serving	At least 1 serving
Potato	1 serving	1 serving	1 or 2 servings
Other cooked vegetable, preferably leafy green	1 serving	1 serving	At least 1 serving
Raw vegetable	1 serving	1 serving	At least 1 serving
Egg	1	1	1 or 2
Lean meat or fish (or other protein-rich food such as cheese)	1 serving	1 serving	At least 1 serving
Whole-grain bread or cereal	2 servings	2 servings	At least 2 servings
Butter	On vegetables and bread	On vegetables and bread	On vegetables and bread
Water	3-4 glasses	3-4 glasses	6-8 glasses
Cod-liver oil, standardized brand	2 teaspoonfuls (or equivalent)	1 teaspoonful (or equivalent) probably desirable	1-3 teaspoonfuls (or equivalent)

table constitutes a simple dietary pattern to guide the patient.

A daily consumption based on the list insures an adequate intake of all those factors known to be essential for optimum nutrition. The individual may freely choose the means of satisfying additional caloric requirements.

Experience in this institution[14] and others[15, 16] indicates that nutritional regulation based upon this plan is of definite aid in the reduction of dental caries.

Under modern circumstances, sugar is used to excess. That its intake should be restricted admits of no argument. Nevertheless, our clinical studies strongly suggest that results frequently attributed to a high carbohydrate content of the diet are in reality due to lowered consumption of protective foods. Large amounts of sugar and other sweets tend to crowd out essential elements. Whether sugar has a direct influence on the production of caries remains a matter of dispute.

The possibility has been suggested that high-carbohydrate diets deplete the calcium reserve of the body, but there is no experimental evidence to support this theory. On the contrary, an increase in the absorption of calcium has been noted when the percentage of carbohydrate was raised.[17] The increase was especially pronounced on the addition of lactose. This effect has been attributed to an increased acidity of the intestinal contents, a condition which, as previously noted, appears to favor the absorption of calcium. In experiments at the Forsyth Dental Infirmary, similar results have been obtained. (L. G. Wesson, unpublished data.)

Considerable thought has been directed toward the dentist's potentialities as an educator. Whatever his function in the health-education program of the classroom may be, he can and does exert a significant influence on the habits of the patient in his office chair. As an exponent of sound principles of nutrition, he offers a health service that frequently results in improvement, not alone in the oral condition, but also in that of the body as a whole.

In pregnancy, the dentist frequently has an opportunity to advise the expectant mother and to confer with the physician as to the general character of a diet favorable to calcification. The patient is often particularly receptive at this time to suggestions regarding nutrition.

Calcification of the teeth and jaws begins at about the fifth month of pregnancy. The premise that the fetus is a parasite upon the mother is often interpreted so as to minimize the importance of nutritional wellbeing at this time. It should be remembered, however, that such a mechanism as this can be protective only within certain limits and breaks down when those limits are exceeded. Study of our clinical records suggests that the dental condition of the young child frequently reflects severe or protracted deficiencies in the maternal diet or disturbances in physiologic function during pregnancy. This observation is in accord with the findings of the Toverud[18] and Mellanby,[19] who consider an inadequate diet during pregnancy as one of the main factors in dental caries in childhood. A recent report on a small number of children published by the Center for Research in Child Health and Development of the Harvard School of Public Health[20] appears to offer corroborative evidence. Superior nutrition during this period contributes indirectly, if not directly, to the child's dentition. Conditions intimately related to tooth development, such as the infant's physical endowment at birth and the mother's ability to produce breast milk, depend in large measure on the dietary habits of pregnancy.

Research has determined the nutritional requirements of pregnancy with a reasonable degree of certainty, but clinical contacts reveal a wide breach between scientific knowledge and actual practice. Ignorance, food prejudices, low

incomes and the undesirable habits of a lifetime frequently mean that pregnancy begins and ends under conditions of nutritive failure. The organism that functions satisfactorily under ordinary circumstances often proves unequal to the extraordinary demands of childbearing. If the reproductive cycle is repeated at rapidly succeeding intervals, the danger is increased. In this connection, protective customs reported among primitive races are noteworthy; namely, special feeding in the premarital as well as pregnant and lactating periods, and the systematic spacing of births.[21]

The first year of life is one of unusual importance in respect to tooth and maxillary development, for the permanent teeth begin to calcify at about the time of birth. This is a pediatric responsibility. The dentist, of course, is not in a position to make nutritional suggestions for infants; but from such sources as the Children's Bureau of the United States Department of Labor,[22] he can obtain current information that will qualify him to confer with both the practitioner and the mother in the interests of sound teeth.

The complete or partial failure of the modern mother to nurse her infant seems regrettable; for, according to natural laws, human milk of good quality is superior to any other food. Doubtless, the infinitely better tooth and maxillary development found among native races is due at least in part to long and successful breast feeding. Also, there is some evidence that the mechanics of suckling has a far more favorable influence upon jaw formation than does bottle feeding. Human milk is especially well adapted to the digestive processes of the infant, and is therefore very efficiently utilized. Early breast milk also contains certain bodies of value for protection against infection during early life. The hygienic advantages of breast feeding are demonstrated by the lower mortality and morbidity rates in this group as compared with those of a similar group artificially fed.[23] While breast feeding is preferred for these reasons, in fairness it must be said that, under the direction of a competent physician and with the intelligent cooperation of the mother, artificial feeding has proved highly successful.

Regardless of whether the baby is nursed or bottle-fed, certain foods must supplement his intake of milk. The physician instructs the mother in the early feeding of orange juice and cod-liver oil and the gradual introduction of cereals, vegetables, fruits, eggs and meat, which offer a variety of essential substances. Furthermore, the diversity of taste, color and texture represented by these foods affords desirable habit training for the baby.

Throughout the preschool years, teeth and bones are developing; new body tissue is under construction, and the child is learning muscular coordination and making mental and social adjustments. The importance of a diet rich in inorganic elements and vitamins can hardly be overestimated. Of equal value at this period is the cultivation of the right attitudes and habits with respect to all health practices. Young children are imitators. Many a parent needs to evaluate his own food customs and manner of living with this fact in mind.

The nutritional requirements of the school child differ from those of the younger patient chiefly in regard to quantity. Milk and its products, vegetables and fruits continue to form the nucleus of the diet, with eggs, meat or fish and whole-grain products making further valuable contributions. Additional foods, such as sweets, may help to meet the total caloric requirements for the rapid growth and strenuous play of active childhood, but should not replace those foods that have been aptly termed the "must" group. Fitful dietary management is not enough. The day-by-day inclusion of essentials is necessary for the

day-by-day development of the healthy child.

With the beginning of school life, the child achieves a degree of independence, accepting new responsibilities and experiencing greater freedom of choice in behavior. Teacher and dentist alike can awaken an intelligent interest in health matters and foster the habit of wise decision. Healthful living brings to the child its intrinsic satisfactions and rewards, such as success in sports and acceptance by the social group. One young clinic patient who had experienced general improvement commented, "In games, I get chosen for sides now."

Dental problems tend to become acute in the preadolescent and adolescent stages, when profound physiologic changes occur. A peculiar and rapid disintegration in the cervical region, differing in some respects from the processes involved in ordinary cavity formation, is frequently encountered. Aberrations in growth and emotional instability are flagrant indications that the body metabolism is being maintained at an erratic pace. The strain of this period is intensified by the pressure of school demands and extracurricular activities. Capricious dietary practices add further complications to the problem at a time when nutritional requirements are substantially increased. The judicious dentist occupies a unique position of influence with the adolescent, who usually regards attempts at parental control with intolerance.

The dentist, like all health workers, needs to keep uppermost in thought the physical attributes of the well-nourished child. His standards tend to be lowered by a long procession of young patients in whom caries of the teeth is accompanied by poor musculature and skin tone; facial expression that shows strain in repose; weight that is inconsistent with skeletal build, and either chronic fatigue or nervous restlessness. A high standard of physical fitness should constitute both yardstick and goal.

What we see in the adult represents for the most part ingrained food habits and other customs which are difficult to change. Yet when a mature patient becomes convinced that an inadequate diet may bring about pathologic states of a serious nature, he will often promptly correct it.

The newer chemistry of nutrition holds promise of extending the period of the prime of life. Fuller realization of the benefits offered by dietary enrichment seems assured.[24] By familiarizing his patients with authentic sources of nutritional information,[12, 25, 26] the dentist can lead them to rely upon facts rather than upon the false promises of food faddists.[27]

Recognizing that many organic irregularities may exist in the adult patient, it is the part of wisdom for the dentist to make dietetic alterations in conjunction with the medical practitioner. On the other hand, dietetic treatment instituted by the physician for achieving some specific effect may result in deleterious reactions on the oral tissues as well as on the teeth. Watchfulness on the part of the dentist should be redoubled at such times. Treatment designed to bring about weight reduction, for example, requires special alertness, as does the administration of diets in which mineral elements are reduced.

Possibilities in the field of oral diagnosis have not been fully explored. It remains for the physician experienced and highly trained in diagnosis to aid in developing this field, but dentists can accustom themselves to look for manifestations of nutritional states. No two mouths are alike, for the reason that physiologic activities are individual, although possessing many common characteristics. The color of the oral tissues, their texture, state and markings; the character of the teeth and their alinement; the nature and activity of the carious process, all indicate approach to or departure from normality, both current and terminated.

Nutritional stability is affected by certain illnesses of a protracted nature, functional disturbance and profound physiologic changes due to adolescence, pregnancy, lactation or emotional fluctuations. It is well within the province of the dentist to inquire into the history of the patient with respect to these conditions. A recent survey[28] of two groups of children with widely divergent dental conditions indicates that oral states parallel to a marked degree the life experiences of the individual. Since the practitioner has his patients under periodic observation over a period of years, he has a rich opportunity to investigate this relationship.

In the mouth is the handwriting of individual physiologic activities. We can interpret comparatively little of what is written. Nevertheless, oral diagnosis has had a beginning and, little by little, we are adding to our store of knowledge. The next step in dentistry is to open the portfolio of facts relating systemic to oral states.

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PRACTICE OF DENTISTRY AMONG THE ANCIENT HEBREWS: A CONTRIBUTION TO THE HISTORY OF DENTISTRY

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AT A PERIOD when the primitive Hebrews were shepherds in the desert, Egyptian civilization was at a point of high cultural attainment and the Assyro-Babylonians were ruled by the Proto-Chaldeans. The history of the Hebrews may be considered to begin with the patriarch Abraham, who is believed to have been a contemporary of the famed King Hammurabi.[30] Having moved from Ur, probably about 2,000 B.C., he migrated into present-day Palestine and his descendants into Egypt, which, at the time, was under the rule of the Hyksos. Here, they sojourned for about the next five centuries.

We are all familiar with the Biblical account of the exodus of these peoples from Egypt, but what is more pertinent, at the time of the exodus—believed to be under the rule of Merneptah, 1225-1215 B.C.—certain religious and political policies were instituted that were to remain the code of the Hebrews for ages. Among the most important was the consecration to the priesthood of Aaron and establishment of the hereditary office maintained by his sons and thus through the tribe of Levi (Levites).

Among the Israelites, the priests enjoyed no medical authority as in Egypt.[2, 39] And so these Levites were merely active health authorities, to whom, nevertheless, people were wont to come for the relief of pain and suffering. Nowhere, however, can it be shown that the Levites, though acting as sanitary police, in any way followed the actual practice of medicine.

Not until the time of the prophets, beginning during the Eighth Century B.C., do we see the practice of medicine taking a foothold. It should be stated here that medicine embraced all the diseases of the body—including dental—as was characteristic of all ancient civilizations. This sacerdotal medicine gained a tremendous foothold, since the ancient Hebrews regarded health and disease as emanating from the divine source, Yahweh (Deuteronomy XXXII:39), the Physician of Israel. (The pious Jew daily prays: "Heal us, O Lord, and we shall be healed, save us and we shall be saved, for Thou art our praise. And bring perfect healing to all our wounds for Thou, Almighty King, art a faithful and merciful Healer. Blessed art Thou, O Lord, who healest the sick of the people of Israel."[36]) The only person to whom one would apply naturally would be the "man of God" (II Kings V), who was even regarded as a "magician," (This cure by "laying on of the hands" finds its

relatively modern counterpart when we read the lives of St. Olaf of Norway, Edward the Confessor, Philip I of France, Henry of Navarre, Louis XVI; *vide*, Fülop-Miller, Rene: Triumph over Pain, The Literary Guild, New York, 1938, pp. 17-18), for medical miracles were at all times sought after.[6, 10, 25, 29, 36]

And so we learn that the "laying on of the hands" by the prophets (II Kings xx:7) becomes important to us since it is recorded that the patriarch Rabbi Jehudah was tormented with a toothache and the prophet Elijah appeared to him and cured him by laying his finger on the painful tooth.[18, 29, 31]

The word *rôphé* means a general physician treating both spiritual and physical pain, giving advice (II Kings xx:7), and one who was known to treat diseases of the eye and of the teeth; i.e., extract a tooth if necessary, and to give advice when a tooth falls out.[3, 38] It is interesting to note that the word is derived from a root signifying soothing. Another explanation is its derivation from *Rapha* (Arabic) meaning to sew, alluding to wound sutures.[39]

The most serious disruption of the life of the ancient Hebrews at this time was the capture of the country by Nebuchadnezzar (believed to have occurred *circa* 586 B.C.) and the casting of the most important elements of society into captivity in Babylon. As II Kings xxiv:14 tells us:

> . . . and he carried away all Jerusalem and all the princes and all the mighty men of valour, even 10,000 captives and all the craftsmen and smiths; none remained, save the poorest sort of people of the land.

And so they developed in "an environment charged with the elements of Babylonian culture."[23] They could not help absorbing some of a system of medicine[11] that in general was theurgic-empiric.[23, 24] We learn of many superstitions and beliefs in the efficacy of magic and sorcery that invaded the life of these peoples and from which they could not free themselves.[24]

How this is brought out in reference to stomatology is shown by the fact that the Israelites believed that tooth decay was caused by a worm[13]—a belief now known to be of Babylonian origin.[37, 38] Bitter herbs were eaten as a "preventive against demoniac influences and to keep demons from entering the mouth," and "the practice of rubbing the gums with date juices" as a defense against evil spirits.[3] These were all expressions of a borrowed demonology. Again, it was efficacious to use the "eggs of grasshoppers as a remedy for toothache; the tooth of a fox as a remedy for sleep. . . ."

Nevertheless, there can be no question that the more learned of the Hebrews with opportunities for study gathered a certain amount of medical knowledge. One only needs to read of the subtle powers of diagnosis which the law (Leviticus XII) demanded of the priest in his examination of persons suspected of leprosy.[3] And they imparted their knowledge, as was characteristic of all ancient civilizations, the father to his son (Deuteronomy VI:7), the experienced master to his pupil; for no scientific schools of the Israelites existed.[7, 10, 36] At this period, no sharp line of demarcation existed between the physician and the practitioner of folk medicine, who was more or less a member of a craft trafficking in formulae and amulets.[33] However, by 200 B.C. the physician was held in honor.[24, 39] Moreover, it is important to note, in addition to the physicians, the Hebrews had developed artisans and craftsmen,[11] professional midwives and pharmacists.[10]

Let us pause for a moment to discuss our chief source of information during pre-exilic times—the Bible. The composers of the narratives of the Bible are believed to be the so-called Elohistic and Yahwistic scribes. Their efforts were combined to form the Hexateuch. These

unknown authors flourished about the sixth century B.C. and are believed to have been contemporaries of the early prophets.[35] Their works were edited by Ezra, the prophet, who flourished during the later half of the fifth century B.C.[11] Passing as a resonant chord throughout their writings is the contest of the hematic (Mesopotamian) and pneumatic (Egyptian) theories and their practical consequences.[24]

Beginning with the return of the Hebrews from Babylon led by the prophet Ezra, down through the fleet centuries, these peoples were living a checkered political life; first as Persian subjects, then, at various times, under the Egyptian and the Grecian yoke, and under the Roman conquest. Placed in such a strategic position, it is little wonder that such a people could not but adopt the culture from these "tides of racial intercourse flowing and ebbing from the Euphrates to the Nile."[37] The social hygiene of the Pentateuch found its model in the priestly hygiene of the Egyptians.[24] Egyptian magic and superstition invaded the land.[33] During the period of Hellenization (323 B.C.-146 B.C.), a great majority of the Jews spoke the Greek language (those in Alexandria spoke a Judaeo-Hellenistic Greek [Sarton]), wore Greek clothes and imitated the Greek manner of life.[23] They may have studied Grecian medicine.[11] Under Persian influence, conquered by a people of similar religious tenets, they absorbed some of this culture, as shown in some of the purification rites.[11, 24]

I must again pause to explain our chief source of information for the post-exilic scientific teachings of these peoples. The whole of Jewish life, in every detail, was controlled by the Torah—the written enactment of the Mosaic code.[6] However, great academies of learning arose, particularly under the patriarchates in Babylon and Palestine, where every phase of the lives of these peoples was discussed, taught, memorized, etc. And so a great body of rabbinical law and tradition grew up, embodied in the work known as the Talmud (in Hebrew, "teaching," "learning").

The development of the Talmud took place in two stages and by commentaries. The first stage was the elaboration of the Mishna (in Hebrew, "teaching," "repetition"), which contains the traditions of the Jews and interpretations of the Scriptures, compiled by Judah "the Prince" *(circa* 135 A.D.-220 A.D.). The second stage was the Gemara (written in Aramaic, whereas the former was in Hebrew), a compilation of supplemental material of the same kind compiled by Rabbi Ashe *(circa* 352 A.D.-427 A.D.). These commentaries were collected in two separate works, that arising from Jerusalem and termed the Palestinian Talmud, completed at the end of the fourth century A.D., and the work edited by Rabbi Ashe and referred to as the Babylonian Talmud, which at the present time is the standard text.

What is the Talmud? The Talmud might be considered the *corpus juris,* "very ill-digested, full of irregularities, incongruities, and discontinuities of all kinds, and containing much material which has nothing to do with law."[35] The medical knowledge, although "copious but naturally unsystematic,"[24] was still based upon "tradition, observations of diseases and experiments upon animals (issuk-de-debarim)."[36] Medicine was an integral part of the religion of the Jews,[24, 36] and medical subjects (including, of course, dental) are treated or alluded to only so far as they concern or elucidate some point of law.[36] For example:

> Rabbi Eleazar (died *circa* 279 A.D.) asks: How shall the teeth and toothache be considered? Shall they be considered as external wounds, since they are hard, or shall they be considered as an internal sore? (B. Talmud, Abodah Zarah 28, a.)

The practice of dentistry was intimately connected with the practice of

medicine, but we do find a distinction between those physicians prescribing for dental ills and those artisans (or craftsmen) who made primitive forms of dental prostheses.

PROSTHESIS

In recent archeologic researches, there have been found certain pieces of dental appliances made by the ancient Phoenicians dating as far back as 1000 B.C. At the museums throughout Europe are preserved specimens of dental appliances made by the ancient Etruscans, Phoenicians, Romans and Greeks[5, 12, 14]; but, to date, there have not been any specimens found that could be attributed to either the Egyptians or the Hebrews.[5]

About the period of late Hellenism, we learn from the Talmud (Shabbot 64, b; 65, a. Palestinian, Shabbot, VI:5) that the Hebrews did make dental appliances.[38] We become aware of this, as explained before, because of discussions relative to some point of the law. The women in those ancient days were no less addicted to the use of armlets, neckchains, nose rings, and earrings, to mention a few.[3] The fact that the Hebraic women wore no veils indicates the demand for some dental restoration to replace, particularly, anterior teeth. And so we find that it was for cosmetic rather than physiologic reasons that the women wore replaceable appliances.[3, 38]

The Talmud (Shabbot 65, a. Palestinian, Shabbot VI:8, c) speaks of the replacement of missing teeth with those of gold, silver and even wood.[25, 29, 36] From a study of certain passages (Shabbot 65, a. Nedarim 66, b), we learn of a *schen zahav* or gold false tooth, which was inserted in place of the natural tooth and could be removed at will. One of the sages, Rabbi Zera (279 A.D.-320 A.D.), speaks of this appliance in connection with the problem as to whether a woman should be permitted in the street with a false tooth. One opinion is in the negative, on the theory that she would want to display it to her friends and she would remove the tooth from her mouth and carry it; and carrying is forbidden on the Sabbath. There was no question or difference of opinion with respect to a silver tooth because it would not stand out from the other teeth so that there was no likelihood of its being removed from the mouth for purposes of display. The removable or replaceable tooth is called *schen-tothebeth*. Again, the Talmud (Nedarim 66, a; 66, b) relates a very interesting tale of a betrothed maiden who failed to win her heart's desire because she wore a *schen-tothebeth* which was extremely unsightly. She appealed to Rabbi Ishmael (who lived during the first century A.D.), who made her one of gold, *schen zahav*, to replace the "inserted" tooth. (The marriage took place.)[5, 20, 31]

The Hebrew word *nagor* could be translated "turner" (Jastrow) or "artisan" (Sudhoff, Preuss, Weinberger). We do know that these *nagorim* were the craftsmen who fashioned the dental appliances.[17, 18, 29, 38] In the Palestinian Talmud (Shabbot, VI:8, c), we learn that a young girl was ashamed to approach a "turner" to ask him to make her another tooth of ivory.[17]

How these teeth were made and who taught the Hebrews the art is an open question. We know that the ancient Phoenicians taught the Hebrews the art of architecture, masonry, shipbuilding and, undoubtedly, the art of metal work.[3] We find false teeth first mentioned in the Talmud during the period of late Hellenism.[38] Brown[5] believes that "most, if not all Jewish prosthetic methods probably came directly from the Romans," whereas Weinberger believes that this influence was from the Etruscans, whose dental art was of a much higher craftsmanship.

What type appliances were they? Without actual tangible evidence, we must rely upon the words of the ancients as a guide or study those types of appli-

ances that have been found which were contemporary with the Hebrews. We have mentioned teeth of gold, silver, wood[29] and ivory (the tusks of the elephant being used).[20] Moses ben Maimon (called Maimonides), the great Hebraic philosopher and physician (1135-1204), is of the opinion that these gold teeth were merely crowns (caps or husks) worn to hide hideous looking decayed teeth.[5, 18, 31] The statement of Maimonides cannot be amiss since Abulcasis (De Chirurgia, II, 33) (936-1013), in the tenth century, described an operation by which artificial crowns were attached to adjacent teeth.[5, 12, 14] Denton is of the opinion that "bridgework and ligated teeth, like the restorations used by the Phoenicians, probably were employed by the Hebrews." Moreover, we must not fail to bear in mind that there have been found gold cast crowns of the Phoenicians of about 1000 B.C. Brown[5] makes the statement that the *schen zahav* is probably the "earliest extant evidence of a gold pontic."

ORAL PATHOLOGY AND THERAPEUTICS

Pathologic conditions of the teeth and their surrounding structures are not without comment and discussion in the Talmud. As previously noted, their science was both rational and empiric. The treatment of disease showed the "use of genuine medical prescriptions but (there is evidence) of superstitious notions, as with all ancient peoples; the principles of homeopathic magic are often resorted to for the relief of pain."[6] Albeit much of the subject matter was charged with superstitious beliefs and a strong influence of surrounding civilizations, we do discern a definite study of oral ailments and their treatment.

The cause of toothache was still the worm.[13] One of the most frequent remedies mentioned is vinegar and salt. Others mentioned were clove of garlic, oil and fruit juices.[18, 29, 31] For example:

> . . . and we have learned: One who suffers with toothache must not gargle vinegar for it, but he may dip something in vinegar and apply it and if the pain is relieved thereby, hence have no fears of the consequences. (B. Talmud, Bezah 18, b.)

For toothache, counsels Rabba bar Rav Huna (died 322 A.D.), take a single clove of garlic, rub it with oil and salt and place it on the thumb-nail of the aching side. It should, however, be circumscribed with a rim of dough and care should be taken that it touch not the skin because there is danger of leprosy. Apply this to the painful tooth. (B. Talmud, Gitten, 69, a.) This type of therapy seems most similar to that practiced by the Romans.[40] Another suggestion was that sour fruit juices be used for toothache as they are not harmful to healthy teeth. (B. Talmud, Shabbot, 111, a.)

Abscesses and inflammatory processes about the jaws were recognized, for we find the following treatment advised in such conditions.[12, 28, 29, 31]

> Rabbi Johanan (born in the last quarter of the Second Century A.D.—died 279 A.D.) said: for (affections of) the palate take bertram (pellitory leaves) which is good as *mamru*. To check (the spread of) inflammation take this into the mouth. To ripen (an abscess) take the bran remaining in the sieve, lentils together with dust, fenngreek, bud of cascuta, and hops; from this a piece about the size of a nut is taken into the mouth. To open (the abscess) white cresses should be blown in by someone through a stalk. To heal, the earth should be taken from near a privy, kneaded with honey, and eaten. This proves effective.

The most interesting case of oral complaint is described in the Talmud. (Yoma, 84, a.) The Hebrew word is *tsfidno*, which means scurvy (Grief, Perlman) or ulcerative stomatitis (Jastrow). That this disease was not uncommon is shown by the remark of the rabbi (B. Talmud, Baba Mezi'a, 85, a), who says "that sufferings are to be borne with resignation." He himself bore them submissively for thirteen years; for six

he suffered from lithiasis; and for seven, from scurvy (stomatitis).[15] The disease was characterized by blood spurting from between the teeth in attempting to eat. Here is the Talmudic discussion:

Rabbi Johanan had this disease. He went to a matron of Rome (Roman) and she treated him on Thursday and at the eve of the Sabbath he asked, "What shall I do on Sabbath?" She said, "You will not need to do anything." He replied, "But, notwithstanding, if I should be obliged to do something."

(After promising to keep the cure a secret [which he failed to do], the following is the discourse on the treatment:)

Rabbi A'ha, son of Rabbi Ammi *(circa* 279-320) said, "Water of leavened dough, olive oil and salt."

Rabbi Yemar (327-468) said, "Not the water but the leavened dough itself, olive oil and salt."

Rabbi Abaya (died *circa* 339) said, "I have used all these remedies and was not cured until an Arab merchant told me that the stones (seeds) of the olive, one-third grown, should be burned in a new *mar,* and be applied to the rows of teeth. This I have done and was cured."

What causes such sickness? Eating hot wheat bread or the remains of a dish of *haisana* (fried fish in oil) of the previous evening.

What are its symptoms? When something is put on the teeth they begin to bleed. Rabbi Nachman ben Yitzchak (died *circa* 356) said, "Scurvy begins in the mouth and ends in the entrails."[6, 15, 28]

The first written about micro-organisms is generally attributed to the Roman encyclopedist Marcus Terentius Varro (116 B.C.-27 B.C.), who wrote:

Small creatures invisible to the eye fill the atmosphere in marshy localities and with the air breathed through the nose and mouth penetrate into the human body, thereby causing diseases. (Rerum Rusticarum, Book I, chap. 12.)

But if, in the following statement of the Rab (Rabbi Abba Arika, died 279 A.D.), the word micro-organism were to replace "evil spirits," how similar become the quotations! We will recall that superstitions and demonology were well established by this time and we then wonder whether Rab had an idea of bacteriology and merely expressed his theory in an allegorical manner (Rappaport):

The evil spirits crowd the academies and are to be found by the side of the bride. They hide in the crumbs that we throw on the floor and in the water we drink, they are to be found in the diseases we contract, in the oil, in the vessels and in the air. No mortal could survive if he saw their number, for they are like the earth that is thrown up around a bed that is sown. (B. Talmud, Berokot, 6, a.)

ORAL HYGIENE

The ancient Hebrews emphasized the importance of the teeth and were no less appreciative of beautiful teeth than we are today. They have recorded many interesting facts as to how the teeth affected their mode of life. Man's strength was measured by the state of his teeth.[28] They realized that anodontia meant ill-health. (B. Talmud, Niddah, 65, a.) Solomon chants:

Thy teeth are like a flock of well-selected sheep, which are come up from the washing, all of which bear twins, and there is not one among them that is deprived of her young. (Song of Songs, chap. IV, 2, 6.)

Before a priest could be admitted into active service in the Temple, he had to undergo a complete physical examination by the officers of the Sanhedrin. If they found the least defect on his body; i.e., a mole with hair in it (B. Talmud, Yoma, 19, a), or he had one or more teeth missing, or if any teeth had fallen out (B. Talmud, Berakot, 44, a), he became unfit for his office.[15, 18, 29, 38]

Rabbi Johanan wrote: "Better is he who whiten's his fellow man's teeth than he who gives him milk to drink." (B. Talmud, Ketubot, 11, b.)[18, 28, 29, 31, 38] "From long continued fasting, the teeth will become black." (B. Talmud, Nazir, 52, b.)[28, 29] Jacob, blessing his children, promises Judah teeth whiter than milk,

and his teeth, indeed, become so strong that, according to Rabbi Chunian, when he (Judah) was in wrath, he could crush iron plates to powder with them.[18, 31] They also believed that the humidity of the bathhouses was harmful to the teeth.[28, 29]

"Spleen, with the gall removed, is good for the teeth, but bad for the intestines. Leek is bad for the teeth and good for the intestines; cook it and swallow it." (B. Talmud, Berakot, 44, b.) The Talmud is replete with cautions and advice about the teeth.

With such a system of general hygiene as the Hebrews promulgated, it seems unlikely that oral hygiene would be excluded or neglected. And we are not disappointed. Cleanliness of the mouth was highly regarded.[29, 38] Scaling the necks of the teeth or the removal of the "toothstone" around the teeth near the gums was advised by scraping or pricking at the deposit.[28, 31, 38] For rubbing the teeth and gums, a salt poultice was used; also, one such poultice was to be placed under the tongue every morning, where it might be dissolved.[29]

The question of *fetor ex ore* is widely referred to in the Talmud. Grief[13] explains that the treatment of this condition is twofold: (a) preventive and (b) curative. The preventive measures were those in which one was cautioned as to the use of certain foods:

Rabbi Johanan says, "eating of lentils will cause fetid odor from the mouth." Rav Mari[15] reports that he also stated, "he who indulges in the practice of eating lentils once in thirty days keeps away quinsy, but they are not good to be eaten because then the breath becomes corrupted." (B. Talmud, Berakot, 40, a.)

The curative measures were those aimed at getting rid of bad breath. We need but to mention the use of salt, pepper, cinnamon or ginger (B. Talmud, Shabbot, 65, a) to combat it. And,

Whoever has eaten a meal without having eaten salt therein; whoever has drunk a beverage without having drunk water thereafter, will be worried during the day with fetid odor from the mouth. (B. Talmud, Berakot, 40, a.)

Samuel said: "To all sickness I know a remedy excepting the following three . . . and if one takes his meal and immediately goes to sleep without having walked four ells . . . (which could cause offensive breath). (B. Talmud, Baba Mezi'a, 113, b.)

It is better to cut the hands off than to touch the eye or the nose, or the mouth, or the ear, etc., with them without having first washed them. Unwashed hands may cause blindness, deafness, foulness of breath, or a polypus. (B. Talmud, Shabbot, 109, a.)

If one does not walk, say four cubits, before falling asleep after a meal, that which he has eaten, being undigestible, causes foulness of breath. (B. Talmud, Shabbot, 41, a.)

The use of the toothpick had become common practice. When its use was introduced, we do not know. We cannot attribute it to the Egyptians for, according to Hirshfeld,[16] the Egyptians "have evidently left no toilet articles suggestive of the use as tooth cleansing instruments." Sudhoff[38] is of the opinion that it was during the days of late Hellenism that this custom came into prominence. Hans Sachs (Kulturgeschichte der Zahnheilkunde, 1913) traces the wooden, quill, gold and silver toothpicks to the Roman era.[16] The toothpick, however, was similarly used by the Persians as well.[24] But let us quote Kanner[18]:

The Talmud on several occasions speaks of qesom, that is, chip or splinter, which was divided on one end by chewing and biting and then used like a toothbrush. Often fragrant wood was used for this purpose. Reed, too, was employed in the cleaning of teeth, but the Talmud (Hullin, 16, b) warns against its use, for it may break off very easily and injure the gums. Solomon ben Isaac (who flourished in the early twelfth century), the great rabbinic scholar and commentator, better known as Rashi, declared the aversion of the Talmud to the use of reed for toothpicks as originating in the assumption that "an evil spirit rests upon it."

The Midrash, in one place, says that even reeds for chiccun were not missing in Palestine. Chiccun is thought by some in-

terpreters to be identical with the Syrian word "chicina," the toothpick, but this explanation has not been generally accepted by all expounders. It seems as though such a splinter was kept in the mouth permanently by some people and Preuss[29] [who states that the toothpick was also used to gnaw at during tooth eruption periods] sees in this a first attempt at orthodontic practice in that the toothpick was held between the teeth in order to correct dental malposition. This opinion seems to be rather far-fetched. [Sudhoff is of the same opinion as Preuss on this question.] As we shall see later, keeping the toothpick in the mouth all day long was a habit in many countries in the Middle Ages and even in later centuries. That it was not considered a bad habit by the ancient Hebrews is evident from the fact that, while they were not permitted to carry anything on Sabbath, nor even wear jewelry, they were allowed to carry the splinter in their mouth.

The toothpick is further mentioned in the following Talmudic simile: "If one says, 'Take out the splinter from between your teeth,' the other answers, 'Take out the rafters from your eyes.' "

To continue:

Rabbi Eleazar said: "One may take a splinter from the wood lying near him to clean his teeth with; the sages say he can take it only from a manger." (B. Talmud, Shabbot, 81, b.)

ETHICS AND JURISPRUDENCE

Philosophy teaches us that the moral law had its beginnings in the Ten Commandments. The code of ethics had its origin in ancient Greek philosophy and in early Hebraic religious writings.[21]

At the time that the Hebrews were forming themselves into a nation, they maintained certain elements of their nomadic life.[2] The ancient law of retaliation—*lex talionis*—was their code. The code of Hammurabi (variously dated between 2250 B.C. and 1900 B.C.) and the Sumerian laws *(circa* 2800 B.C.) seem to have exerted some influence on the tenure of the primitive motive of the Hebrews.[2, 29] Let us study, by comparison, the expressions of the former code with that found in the Book of the Covenant *(circa* 1200 B.C.):

Code of Hammurabi:

If a man destroy the eye of a man, his eye shall they put out.

If a man knock out the teeth of his equal, his teeth shall be knocked out.

Exodus, Chapter XXI

23: And if any mischief follow, then thou shalt give life for life.

24: Eye for eye, tooth for tooth, hand for hand, foot for foot.

Leviticus, Chapter XXIV

20: Breach for breach, eye for eye, tooth for tooth, in the manner as he hath caused a bodily defect in a man, so shall it be done to him.

Deuteronomy, Chapter XIX

21: And the eye shall have no pity; but life (shall go) for life, eye for eye, tooth for tooth, hand for hand, foot for foot.

But, during the fleeting centuries, and with the pressure exerted by conquering and surrounding neighbors, the Israelites soon abandoned the supreme sacrifice, and we note that the "laws were growing less harsh and cruel, and becoming more liberal and scientific."[2, 23] The Talmudic law is now much more "tender than the Biblical and the *lex talionis* is softened into an equivalent."[15]

An excellent illustration of this is shown through comparison with the Roman code—a contemporary in part—which compares rather favorably. In the Roman law of the Twelve Tables (enacted 450 B.C.),[14] which was the *corpus juris* until the Justinian Age, there is found:

Whoever shall cause the tooth of a free man to fall shall pay a fine of 300 *as** and for that of a slave, one hundred and 50. Table VII, at the *rubric de delectis.*

Now, in the Babylonian Talmud is the statement:

*In most ancient times of Rome the copper or bronze coin which was called "as" actually weighed an as, or a pound, but, in 264 B.C., it was reduced to 2 ounces, in 217 to 1 ounce, and in 191 to one-half ounce. Specimens are in the British Museum. (Winston's Encyclopedia, 1921.)

If a man blinds the eye of his slave and thereafter strike out one of his teeth, he shall manumit the slave for the sake of his eye, and for the value of his tooth. (Baba Kama, 73, b.)

Other regulations (B. Talmud, Kiddushin, 24, b. Baba Kama, 26, b) were that when a master (who also may have been a physician) had been implored by his slave to treat his eye and he blinded it; or to drill his tooth, and he broke it out, the slave went free.

DENTAL SURGERY

When operative procedures, even of the crudest type, were introduced, we do not know. Weinberger concludes that "apparently the Egyptians did drill to remove pus" from a purulent area around a tooth. However, the first record of scraping a tooth is made by Scribonius Largus, who flourished in the first half of the first century, when he advised the cutting away of the diseased part of a tooth with a scalpel adapted for the purpose. Credit is also given to Celsus (De Medica, Book VII, chap. 3, sec. 5) (25 B.C.-50 A.D.), who prescribed filling the cavity with lint or lead in order to prevent the tooth from breaking during extraction.[14]

In the ancient Hebraic text, we are not without mention of such procedures[36]:

How do we know that we are allowed to use a wooden prick, or a thorn, or a needle, or a stylus as well as an awl for drilling? Because it is written. (B. Talmud, Shabbot, 65, a.)

In the legal phase (as noted above):

The Rabbis also taught that if the master who was a physician wanted to paint the eyes of a servant and blinded him or if drilling his tooth resulted in the need of an extraction, the servant went free. (B. Talmud, Kiddushin, 24, b.)

The exact nature of this drilling is not understood. Whether it was to allow for drainage of a purulent area or for the removal of "toothstone" or actual excavation of a cavity in the tooth remains undecided. We do know with certainty that the correct translation from the Talmud *lachtor lo shinon* means "to drill (break into, bore) a tooth.

The practice of extracting teeth was frowned upon; but this is no wonder, when we learn of the barbarous method employed. Rab advises his son Hyyah:

Do not make a habit of taking medicine. Do not make long strides. Avoid having a tooth extracted. (B. Talmud, Pesahim, 113, a.)

Rabbi Hannel (Chananel) adds:

If an eyetooth hurts you, do not have it extracted because of the eye.

Nevertheless, the extraction of teeth was performed,[18] and we may quote Preuss[29]:

At first, the investing gum tissue was incised. Then the tooth was well-shaken until it was loosened. Then, with *summo periculo evellitur*, the extraction was attempted with the fingers and, if this failed, a forceps was used which was more like a smith's instrument than any surgical appliance.

I have attempted to show that the ancient Hebrews in their medical practices diagnosed and treated diseases of dental manifestation; that the general physician acted as the dentist; that dental prosthesis was not unknown and certain types of crown and bridgework were made by certain craftsmen or artisans, who, however, did not evolve a separate system of dental therapeutics, but one based upon neighboring civilizations, showing both rationalism and empiricism, but not unaffected by superstition and by demonology; that when a complete history of dentistry is written, the chapter dealing with the Hebrews (ancient and even medieval) cannot be omitted by dental historians.

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A BACTERIOLOGIC APPRAISAL OF SOME MATERIALS USED IN ROOT-CANAL THERAPY

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THE object of this study was to determine (a) the efficiency of small amounts of antiseptics employed clinically; (b) whether absorption of the medicament by paper points was sufficient to lower its effect as an antibacterial agent, and (c) whether the presence of serum acted as a deterrent.

Review of the dental literature reveals that certain medicaments are employed in small quantities in root canals. Walker[1] states, "Formocresol should be used in minute quantities. If paper or cotton points are used for carrying this disinfectant, only the very tip of the point should be moistened." Blayney[2] gives the following advice concerning the use of beechwood creosote: "When employed in root-canal therapy, only the smallest amount is placed on the point of a paper dressing, which is inserted within the canal but never brought in direct contact with the apical tissues."

Other medicaments, such as oil of cinnamon, cloves, eugenol and phenol compound, are also employed in relatively small amounts. The irrigation of canals with the chlorine preparations demands larger quantities. At times, however, a paper point moistened with one of the chlorine compounds may be inserted in a canal as a dressing.

Absorption of antiseptic dyes by paper dressings has been observed by Fleming,[3] who writes:

> These experiments show that paper has such an affinity for antiseptic dyes that it will successfully compete with the bacteria for the dyestuff and render it inactive as an antibacterial agent. The affinity of dyes for dressings and other things must be taken into account in the consideration of the use of these antiseptic dyes.

Since the medicaments employed in root canals are so frequently carried on paper or cotton points and in such small quantities, this observation of Fleming was kept in mind during the tests.

The effect of organic matter on the antiseptic medicaments introduced into the canals has led to varied conclusions. Grove[4] concludes, from his results in diffusing colored medicaments through coagulated albumin:

> Coagulated albumin was not impermeable and therefore medicaments possessing coagulating properties are not contraindicated in the treatment of septic root canals. While the coagulum may retard the penetration slightly, it cannot do so sufficiently to be of any serious consequence, especially the small amount of albumin existing in the root canal.

On the other hand, Coolidge[5] writes, "Drugs which coagulate protein have only a shallow penetration and are not qualified for the treatment of infected canals containing organic matter."

An investigation was made by Horton and Kitchin[6] to confirm or refute the idea that an antiseptic is self-limiting in its action if it is a coagulant. They used the plate-cup method of Himebaugh, employing both meat extract agar and

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10 per cent horse serum-meat extract-agar. The test organisms were *Staphylococcus aureus* and the typhoid bacillus. The antiseptics were tested in 0.5 cc. amounts. Some of the results obtained by Horton and Kitchin were as follows:

1. Formocresol produced the largest zone of inhibition and the drug was not affected by the presence of serum.

2. The antiseptic power of hexylresorcinol S. T. 37, a non-coagulant, was impaired greatly by the presence of serum.

3. The activity of beechwood creosote, a coagulant, was curtailed from 3 to 5 per cent in the presence of serum. The authors believe this is of little practical importance. They conclude: "We feel that the results obtained, particularly in regard to beechwood creosote, indicate that the idea of its limitations caused by its coagulating power has been overemphasized."

Fig. 1.—Results with formocresol and beechwood creosote. The degree of bacterial inhibition is indicated by the clear zone surrounding the paper point. In Figures 1-5, paper point 1 was moistened for half its length with antiseptic; in point 2, the medicated portion was covered with 50 per cent serum broth, and in point 3, one half of the paper point contained the medicament and the other half was moistened with the serum-broth, the medium being a 10 per cent serum-beef infusion-agar inoculated with Staphylococcus aureus.

The effect of organic matter on the chlorine preparations has been emphasized in the literature. Fleming[7] found that, after a period of five minutes in wounds, the strength of a hypochlorite solution had fallen from 0.5 to 0.13 per cent, and in ten minutes, to 0.11 per cent. Such a concentration, according to Fleming, possesses little if any bactericidal power. Coolidge[8] states, "Hypochlorite solutions have a solvent action on necrotic tissue although their germicidal value is quickly exhausted." Grossman[9] says that chlorine preparations "have generally been favored for root-canal therapy, but because of lack of stability or rapid decomposition when in contact with organic tissue or tissue fluids, such preparations have not been entirely satisfactory."

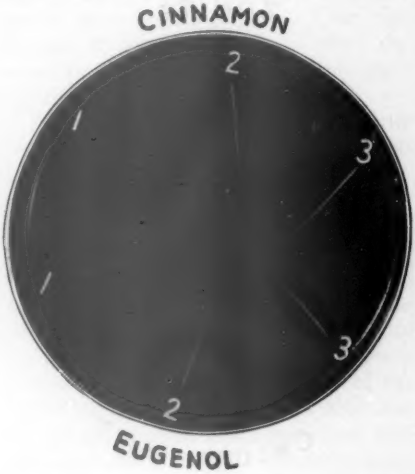

Fig. 2.—Results with oil of cinnamon and eugenol.

In order to overcome this defect, other preparations of chlorine have been produced. More recently, Schmelkes and Horning[10] reported that the compound

azochloramide in triacetin acts with and oxidizes organic matter very slowly and thus remains available for bactericidal action for long periods of time. These investigators found azochloramide four times as effective in the presence of 10 per cent serum as chloramine T and sixteen times as effective as sodium hypochlorite. When in contact with 50 per cent serum, azochloramide was ten times as effective as chloramine T and forty times as effective as sodium hypochlorite. Both Ross[11] and Grossman[9] record the efficacy of this preparation in root-canal therapy.

Fig. 3.—Results with zonite and chloramine T (1 per cent).

Fig. 4.—Results with azochloramide in triacetin.

This review of the literature indicates that some medicaments are employed in root canals in minute quantities and their limitation through absorption by either cotton or paper points should be considered, and that the presence of organic matter does have an effect on some of the germicides, particularly the older chlorine preparations.

PROCEDURE

Sufficient volumes of the medicaments were employed to moisten the paper points for about one-half their length. This was done by carrying the medicament on a small loop to the cotton point, which was held by sterile pliers. The paper points used were of the larger sizes and the fine points were clipped off with sterile scissors before the medicament was applied. After one-half its length had become moistened, the point was brought in contact with a loopful of 50 per cent horse serum-broth, in one of two ways: (1) placing the serum broth directly over the moistened portion of the paper point or (2) saturating the remaining half of the point with the serum broth. At the same time, other points carrying the medicament moistening half their length, but free from serum-broth, were used as controls. All the paper points were placed on the surface of 10 per cent serum infusion-agar contained in petri plates. Prior to being poured into the dishes, this agar medium, after being cooled, but still in a melted state, was inoculated heavily with either a broth culture of *Staphylococcus aureus* or with freshly expectorated saliva. (0.5 cc. per hundred cubic centimeter medium.) After twenty-four hours' in-

cubation, the degree of inhibition about the paper points was noted.

To determine whether use of the paper points limited the antibacterial effect of the medicament through absorption, control tests were made by placing an equal quantity of the medicament directly on the surface of the medium.

RESULTS

1. The action of formocresol was not restrained by the presence of the serum, a marked area of bacterial inhibition, by far the largest of all the products tested, resulting.

Fig. 5.—Results when the paper points were moistened with equal volumes of zonite, chloramine T or azochloramide.

2. Oil of cinnamon also produced a large area of inhibition. No bacterial colonies developed in an area approximately two-thirds the size of the clear zone caused by the action of formocresol. The presence of serum did not limit the action of the oil of cinnamon.

3. Eugenol inhibited bacterial growth in a zone about one-half that formed by the oil of cinnamon. The presence of serum did not seem to affect this drug.

4. Beechwood creosote restrained bacterial proliferation in an area about equal to that of eugenol. The presence of serum did not affect this drug.

5. Zonite and chloramine T produced little if any inhibition. The latter was tested in 1, 2 and 4 per cent concentrations. Since Fleming has noted the rapid disintegration of hypochlorites in the presence of organic matter (ten minutes), this type of test is no indication of their value. Actually, in a period of ten minutes, the chlorine preparation does not penetrate very far, and since it is rapidly dissipated as a result of its contact with organic matter, it has little influence on the organisms present in the agar, which, in the ensuing twenty-four hours, develop into colonies. Tests performed in liquid media may show destruction of organisms in relatively short periods of time.

6. Azochloramide produced a definite area of inhibition and, in effect, was about equivalent to beechwood creosote or eugenol. The presence of serum apparently had no effect in limiting the action of this germicide.

7. Growth of *Staphylococcus aureus* was always inhibited to a greater extent than growth of the organisms present in freshly collected saliva. Whether this is due to the varied bacterial flora of the saliva or to the fact that the inoculum of saliva contained more organisms than an equal inoculum of a staphylococcus-broth culture is undecided.

8. The paper point apparently had no effect in limiting the antibacterial activity of the antiseptics tested. When equal quantities of the medicaments were placed directly on the surface of the medium, the zones of bacterial inhibition were relatively no larger than those found about the paper points moistened with the antiseptics.

CONCLUSION

These tests indicate that formocresol, beechwood creosote, oil of cinnamon, eugenol and azochloramide in small amounts do inhibit bacterial growth.

The findings of Horton and Kitchin in regard to formocresol and beechwood creosote are corroborated. The limitation of antibacterial activity through absorption by paper points was not noted with the antiseptics tested. With the exception of zonite and chloramine T, the presence of serum was not found to be a deterrent.

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CAN PERIODONTAL DISEASE BE CURED?

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CAN periodontal disease be cured? Ever since the practice of dentistry became a science, this question has been asked, and only in recent years have those particularly interested in the field of periodontia been able to answer in the affirmative: Periodontal disease can be cured.

Such an assertion may arouse severe criticism, but fifteen years of practice devoted exclusively to periodontia has led me to certain definite opinions regarding the treatment of the condition. Questions such as these arise: 1. Is it merely retarded? 2. Does it return? 3. Are all cases cured?

Before we enter into further discussion, it might be well to define what is meant by cure. By the cure of periodontal disease, we mean that (1) the teeth become firm and useful members of the dental apparatus; (2) suppuration and bleeding cease; (3) pockets are eliminated; (4) the gingivae become firm, resistant to infection and of a normal healthy color, and (5), in some cases, it may be observed roentgenographically that filling-in of bone occurs, whereas, in others, an increase in density of bone is established. However, filling-in of bone does not occur in every case and need not be considered necessary for a cure. There may be no return to an ideal condition, but the progress of the disease has been checked and what remains of the periodontium continues to be healthy.

The procurement of health is then definitely established. The next problem is the maintenance of periodontal health in the mouth. After a cure has been obtained, by the removal of all

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etiologic factors, elimination of the effects and the raising of tissue resistance, all these conditions must be maintained by both dentist and patient, to insure the permanence of the successful result.

The patient is required to (1) continue with the method of brushing and massage that has been taught, (2) maintain good oral and general health and (3) appear at the dental office for a check-up at regular intervals. As a result of such cooperation, the dentist is able to prevent any local disturbances from manifesting themselves.

There are cases, of course, which have progressed too far for treatment. Despite all efforts, they will not respond to therapy.

In other cases, the etiology is obscure and the progress of the disease is so rapid that treatment is instituted only as a temporary relief measure. However, if the etiologic factors can be successfully controlled and the prognosis is favorable, the patient can be given reasonable assurance of the success of the treatment.

With some exceptions, the usual procedure is to eliminate all local and systemic etiologic factors, remove all gingival and subgingival calculus by the use of prophylactic instruments, surgical measures or electrocoagulation and teach the

Fig. 1.—Appearance of mouth of patient, aged 38; showing separation of upper central and lower central incisors and gingivitis; November 1930.

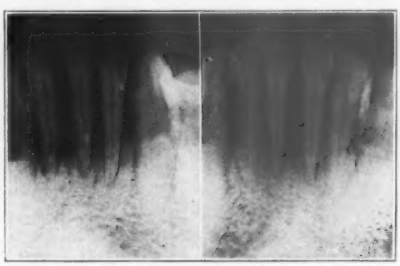

Fig. 2.—Lower anterior teeth, November 1930.

Fig. 3.—Condition four months later (February 1931). The teeth have returned to the former position in the arch. There is improvement in gingival tone.

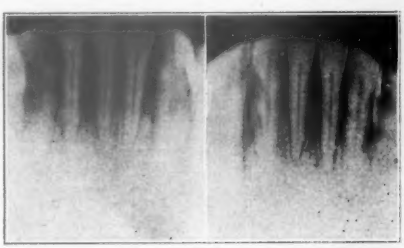

Fig. 4.—Filling-in of bone. The wire had been removed.

patient gingival massage and instruct him in what constitutes a well-balanced, vitamin-containing diet.

The following is one of many cases that have been treated successfully.

REPORT OF CASE

A dressmaker, aged 38, who came in for examination in 1930, had a severe periodontal disease, with loose teeth, bleeding gingivae, suppuration on the slightest pressure and spreading of the teeth. (Figs. 1 and 2.) Photographs are in protrusive position.

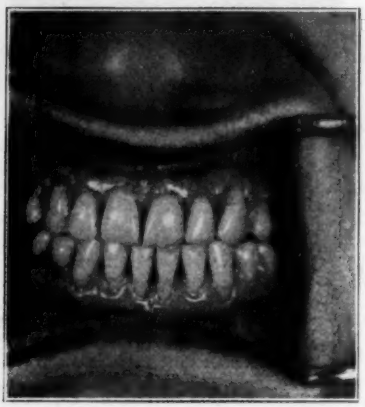

Fig. 5.—Two years after treatment was started. Improvement of the tone of the tissues is evident.

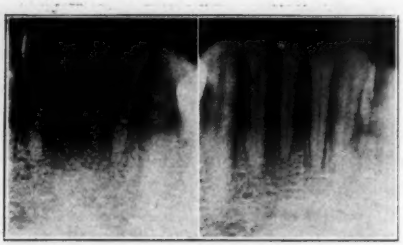

Fig. 6.—Further filling-in of bone.

The treatment consisted in control of the diet and local and systemic etiologic factors, instructions regarding toothbrushing, equilibration of occlusion and removal of all calculus with hoes and curets. After four months (Figs. 3 and 4), the mouth had improved so much that the patient was dismissed for a two-months period of observation. The upper anterior teeth had returned to normal position in the arch. The lower teeth had also assumed their former positions, but were retained by a single wire for a period of two months. The wire was then removed, and there has been no recurrence of disease. Figures 5 and 6 show the case two years after treatment was instituted.

Fig. 7.—Condition ten years after treatment, showing maintenance of health. The patient was not seen for five years. The upper and lower central incisors have moved closer together (November 1940).

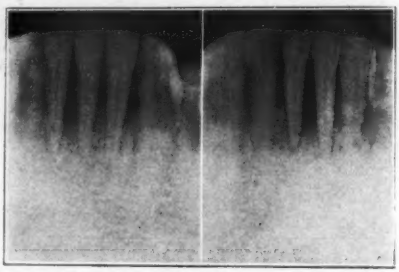

Fig. 8.—Appearance of bone, November 1940.

It is now ten years since the condition developed, and although the patient did not return until recently, after a lapse of five years, the tissues remained in a perfect state of health. (Figs. 7 and 8.)

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TRANSLUCENT DENTIN

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INTRODUCTION TO THE PROBLEM

THE study of the elementary principles of physics is not merely an abstract mental exercise for a profession that finds itself habitually and instinctively detecting and appreciating applications of these principles in unexpected places. While the dentin of a tooth has been considered biologically and its composition determined chemically, it nevertheless possesses properties fundamental to the physical concepts of light.

The phenomena that occur when a beam of light passes from one medium of a given density through another medium of a different density is called refraction.[1] However, a beam of light striking irregular dentin is not totally refracted, but, in large part, is diffusely reflected. If the beam of light passes obliquely into the dentin, it may be totally reflected, this depending on the density of the dentin and the angulation of the beam. That portion of the dentin through which light is refracted is translucent dentin. That portion of the dentin that diffusely reflects light is opaque dentin. Many investigators have observed that when a beam of light is passed through a thin longitudinal cross-section of dentin, there are areas of different light density within that dentin, opaque, translucent and even transparent.

The recent usage of the term "opalescent dentin" has led to confusion in the description of translucent dentin. Some believe the term "opalescent" to be the opposite of "opaque." Others liken the uncut translucent opal, which when sectioned becomes transparent or "opalescent," to the unsectioned translucent dentin, which when sectioned becomes in part transparent. A few interpret the pleochroism between the opalescence of opal and the transparency of translucent dentin to be grounds for calling transparent dentin "opalescent." Obviously, if a section of dentin is sufficiently thin that when a beam of light passes through it, the area ordinarily opaque becomes translucent and the area ordinarily translucent becomes transparent, the differences among opaque dentin, translucent dentin and transparent dentin become the subtleties of molecular physics and atomic structure.

In cases of incomplete agenesia of the enamel of a tooth wherein a minute amount of enamel remains as a thin layer in the deep longitudinal grooves, the pleochroic property is recognized clinically and the enamel, under these conditions, is opalescent. The hereditary aspect of dentinogenesis imperfecta (opalescent dentin) has been studied recently, but there are other conditions under which dentin becomes translucent. Translucent zones in the dentin under a carious lesion have been recognized. The erosion of enamel from the dentin in the gingival area renders the dentin translucent, with a color range from light yellow to dark brown. An abrasion of the enamel results in an eventual translucency of the subterminal dentin. The application of chemical irritants to dentin

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will result in zones of subjacent dentin that are translucent. In old age and in cases of paradentosis, a marked area of translucent dentin appears about the apical third of the root of the tooth. (Fig. 1.) Peter J. Brekhus, of the University of Minnesota, was one of the first to note this fact in conjunction with the problem of sectioning of teeth for histologic purposes.

The problem is to determine whether translucent dentin indicates a complete consolidation of the dentin by calcification of the tubules or by a decalcification of the dentinal matrix into the tubules.

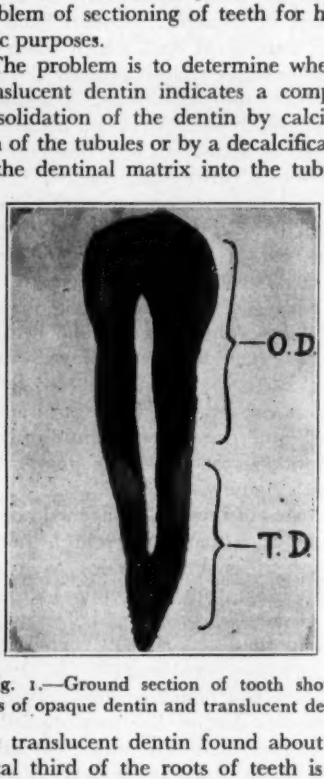

Fig. 1.—Ground section of tooth showing areas of opaque dentin and translucent dentin.

The translucent dentin found about the apical third of the roots of teeth is the source of material used in this study because of its frequency of occurrence and its abundance. A review of the literature will reveal that as various physical means of detection have been created, so have various theories of calcification and decalcification been presented which are intimately related to the problem of translucent dentin.

PHYSICAL APPLICATIONS TO THE PROBLEM

From a historical viewpoint, translucent dentin should have been recognized grossly before the discovery of the microscope. However, there is no historical evidence that this was the case. The eighteenth century pen and ink drawings of longitudinal sections of teeth magnified twelve times by Tomes and Nasmyth show areas in the dentin of obliteration and consolidation of tubuli; but there is no description of translucent or transparent dentin accompanying these free-hand drawings. The following century (the nineteenth) is one of contributions to knowledge by many investigators. Prominent names in the field of dental anatomy, histology, embryology, physiology and bacteriology are John Hunter, Adolph Retzius, Theodore Schwann, Oscar Hertwig, Ivan Pavlov and W. D. Miller.[2] It is probable that W. D. Miller, a bacteriologist, originated the term "transparency of dentin" in his description of the response of dentin to irritation as observed in ground sections.

Enamel and dentin have been studied with the polariscope, notably by Valentin (1861), Hoppe (1862), Kirk (1903), von Ebner (1906), Andresen (1921), Schmidt (1923), Beust (1928) and Kitchin (1933).[3] Little is said of translucent dentin by these investigators. However, a great amount of work has been reported controversially on the positive and negative birefringent property of enamel. It is noteworthy that, by means of the polariscope, von Ebner,[3] in 1906, classified enamel from the soft embryonic state through the transitional state to the stone hard state. Thus, he advanced the theory that the development of enamel implies cellular activity on the part of the ameloblast and that calcification is a process superimposed on the primarily developed groundwork. This polariscopic study of von Ebner on enamel is especially interesting in the sense that this same phenomenon of calcification has been detected and observed with different physical apparatus, by Mellanby (1928),[4] Beust (1928),[5]

Applebaum (1932),[6] Karlstrom (1931),[7] Chase (1935),[8] Applebaum, Hollander and Bodecker (1936)[9] and, recently, Diamond and Weinmann (1940),[10] although it has not been correlated with the theory of calcification as presented by other investigators. From a metabolic viewpoint, the theory of calcification as presented by Diamond and Weinmann is a plausible explanation for the presence or absence of translucent dentin within opaque dentin.

The x-rays, discovered in 1895 by William Roentgen, have been used as a physical detector of translucent dentin. It is not possible to distinguish translucent dentin from opaque dentin with the ordinary dental x-ray machine of 30,000 volts, 0.05 Angstrom units, although it has been noted by Lyons[11] that, in cases of extremely translucent dentin (opalescent dentin), the root canals appear to be totally absent and the root size is decreased. Hodge[12] has shown that normal opaque dentin is nearly equivalent in x-ray absorption to an equal thickness of pure aluminum, while enamel is nearly equal to twice its equivalent thickness. By using an x-ray machine with a capacity of 10,000 volts, 1 to 3 Angstrom units, Applebaum[6] has been able to demonstrate the contour lines of Owen and the transparent zone subjacent to caries, and to distinguish opaque dentin from translucent dentin. The rays from this capacitated machine are called the grenz rays. The x-ray camera has not found a complete application to the field of translucent dentin, but has been used by Thewlis[13] in a study of the crystalline structure of enamel, which he concluded to be hexagonal.

Physical hardness tests have been made of translucent dentin, but the results are confusing because of a lack of standardization. Richter describes translucent dentin as harder than opaque dentin and also notes that the next hardest dentin is to be found in the coronal portion directly under the enamel. Hodge[12] and Skillen[14] report that the entire dentin shows a low microhardness in cases of markedly (opalescent) translucent teeth. Karlstrom (1931),[7] using the Herbert pendulum hardness tester, noted that the calcium deposition was less along the dentino-enamel junction, but did not associate it with translucent dentin as his study was primarily of enamel. Proell and Schubert found in dog teeth an increased hardness in the translucent areas which resulted from artificial exposures of the dentin.

The light scattering property of dentin has been studied by Manly, Bonner and Hodge,[15] who found that the empiric equation of Bloch and Revwick held for the relationship between transparency and the thickness of normal dentin. They conclude that the coefficient for normal dentin is about 300 times the absorption coefficient; that translucent dentin, because it contains partially calcified tubules with less scattering surface, has a scattering coefficient one-twentieth that of normal dentin, but that the absorption constant is not changed.[15]

The histologic studies have been perhaps the most illuminating. "Many investigators agree that there is a close resemblance to matrix dentin with the relative absence of tubuli patterns, and it is this homogeneity that probably renders the tooth highly translucent."[16] Roberts and Schour,[17] in a discussion of dentinogenesis imperfecta (hereditary opalescent dentin), describe dentinogenesis in a manner which is explanatory of translucent dentin.

Schour and Massler write:

> The dentin matrix, unlike enamel, is deposited not in globular units, but in a rather viscid fluid state, which soon becomes calcified. . . . The formative cells of the dentin matrix are not as yet definitely known or established. The matrix is first deposited . . . as the uncalcified, precollagenous predentin layer. The so-called Korff's fibers course spirally between the odontoblasts and become an integral part of the matrix as the fibrillar substructure. . . . The . . . (odonto-

blasts) . . . recede in synchrony with the matrix deposition. During this process, the odontoblasts leave behind them long protoplasmic processes (the dentinal fibrils), which become enclosed within the dentine matrix, forming . . . (the dentinal tubules). . . . The odontoblasts form the dentinal fibrils, but are not necessarily responsible for the actual matrix formation. Atypical dentine can be formed under certain conditions . . . without the presence of the odontoblasts or dentinal tubules.[18]

Kronfeld[19] states that in the case of irritation or injury to the dentin, Tomes' fibers become calcified. He writes:

The calcium salts that are normally in solution within the tubules are precipitated and the tubules are obliterated by inorganic material. As a result, the difference between the optical refraction of the tubules and the matrix is greatly decreased and the dentin becomes transparent. Beust[5] reported a difference in the penetration of dyes into dentin under different conditions. Although the dentin of young teeth stained readily from the pulp chamber outward to the dentinoenamel junction, he found in older teeth areas into which the dye did not enter. Beust called these translucent areas sclerosed dentin, as they are the result of a precipitation of inorganic salts into the tubules. He found this change under abrasion as well as under caries; in either case the sclerosis is a defense reaction of Tomes' fibers to external irritation.

He also states that Beust called attention to the fact that sclerosis of the dentinal tubules is invariably found, though to a varying extent, in teeth of individuals of advanced age, regardless of outer irritation. He continues:

By staining ground sections with an alcoholic solution of diamond-fuchsin, Orban[20] found that the dye entered all dentinal tubules and their ramifications except the zones of transparency, in which the tubules did not stain. This indicated that the latter were completely obstructed; their staining properties were not influenced by treating the section with ether, which suggested that they contained no fatty substance. The content of the tubules in the translucent area had the same optical properties as the dentin between the individual tubules. . . . Recent investigations concerning the changes in the dentinal tubules have revealed that the precipitation of calcium salts is not the earliest expression of irritation. If ground or frozen sections through translucent dentin are treated with fat stains (Sudan scarlet red), fat droplets can be seen in the tubules (Euler and Meyer).[19]

From this review, the fact is borne out that the etiology of translucency of the dentin is presumptive and at variance. Therefore, it is possible that a chemical quantitative analysis of translucent dentin as compared with opaque dentin may be enlightening.

A CHEMICAL APPROACH TO THE PROBLEM

Quantitative chemical analyses of translucent dentin have been made by several investigators. Kimmelstiel[12] and Langemak[12] have reported little difference in the calcium contents of translucent root tip dentin and other dentin in the same tooth. Cohn[12] reported a greater water content for a transparent zone under caries. Fish[12] and Ferguson[12] found little difference between the calcium contents of two very translucent teeth and the average for all teeth studied.

As the quantitative chemical approach to the problem gave indications too of a "slight" difference (Kimmelstiel, Langemak, Fish and Ferguson), the problem of the total inorganic composition of the opaque dentin as compared with the total inorganic composition of the translucent dentin of the same tooth was considered in order. The analysis follows.

METHOD OF ANALYSIS

Twenty-four teeth showing markedly translucent root tip dentin were dehydrated for three weeks in absolute alcohol. The cementum was mechanically removed by means of a No. 557 cross-cut fissure bur and the root canals were filed. The translucent dentin was sectioned from the opaque dentin for

each tooth and each fraction properly bottled and labeled.

Independently, these fractions were crushed in a steel swager, and the crushed contents were pulverized with a smooth glass mortar and pestle. The pulverized fractions were transferred to weighed platinum crucibles, in which gross weights of the samples were determined. The pulverized fractions in the platinum crucibles were dried to constant weight in an oven at 110° C., after which they were ashed to constant weight at 850° C. The time consumed for each batch varied from four to five hours. The results were as follows:

Statistics for the opaque dentin fraction: Average, 70.71 per cent ash; standard deviation, 1.06; standard error, 0.22.

Statistics for the translucent dentin fraction: Average, 68.97 per cent ash; standard deviation, 1.09; standard error, 0.23.

There is 1.74 per cent less ash in translucent dentin than in opaque dentin in the analysis of these particular teeth. The probability that this difference (1.74 per cent) is due to errors of random sampling or chance as computed from the formula $t = \frac{\overline{D}}{SE_D}$ is less than one in ten thousand.

From the analysis thus far presented, it is apparent that the inorganic content of translucent apical third dentin is significantly less than the opaque dentin from the middle third of the same tooth.

To determine whether this significant difference is due to the fact that the teeth selected were markedly translucent at the apex, it was necessary to select for controls samples that were not markedly translucent at the apex. The difficulty in collecting this type of a control lies in the fact that, usually, erupted teeth that have functioned have some translucent dentin at the apex. In fact, the only teeth thus far observed that rarely show areas of slightly translucent dentin about the apex are: (1) teeth fully developed though unerupted, (2) teeth from which the root end has been resorbed during orthodontic regulation, (3) teeth from which the root end has been resorbed owing to the presence of a radicular cyst and (4) teeth from which the root has been resorbed after a coronal restoration. Teeth that have been devitalized are as likely to have translucent dentin about the apex as those which have not been devitalized. From casual observation, it appears that the apices of teeth which are surrounded by periapical bone disease are slowly eroded, with the result that the translucent dentin becomes less as the case becomes progressively chronic.

Because it was not expedient to acquire a sufficient number of teeth which contained no translucent dentin at the apex for controls, twenty-three teeth from young persons that showed only a slight amount of translucent dentin were selected for controls. These were analyzed in exactly the same manner as the markedly translucent teeth. The results are as follows:

Statistics for the opaque dentin fraction (controls): Average, 70.68 per cent ash; standard deviation, 0.84; standard error, 0.18.

Statistics for the slightly translucent dentin fraction (controls): Average, 69.29 per cent ash; standard deviation, 1.03; standard error, 0.22.

The probability that this difference of 1.39 per cent ash between the opaque dentin and the slightly translucent dentin is due to errors of random sampling or chance is less than one in ten thousand as computed from the formula $t = \frac{\overline{D}}{SE_D}$.

SUMMARY

The differences between the markedly translucent dentin samples and the slightly translucent dentin samples are summarized in the accompanying table.

DIFFERENCES BETWEEN MARKEDLY AND SLIGHTLY TRANSLUCENT SAMPLES

	Percentage of Ash Opaque Fraction	Percentage of Ash Translucent Fraction
Markedly translucent samples (24)	70.71	68.97
Slightly translucent samples (23)	70.68	69.29
Differences	0.03	0.32

A statistical analysis of the differences presented in the table reveals that the figure 0.03 is insignificant and the figure 0.32 significant as computed from the formula: $\frac{x_1 - x_2}{\sqrt{SEx_1^2 + SEx_2^2}}$

The conclusion to be drawn from the table is that there is a slightly, but statistically significant, lower inorganic ash content in the translucent dentin fraction of teeth, as compared with the opaque dentin fraction of the same teeth. On account of the minor absolute differences in ash content of the specimens of marked and of slight translucency, and because the ash weight of some opaque regions was lower than that of the translucent regions of other roots, translucency of dentin cannot be attributed entirely to a lower content of mineral matter.

Thus, this analysis is presented in support of the hypothesis that anabolic calcification of the dentinal matrix is capable of catabolism, which is manifested by the formation of translucent dentin.

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THE PARTIAL DENTURE AS A MEANS OF STABILIZING ABUTMENT TEETH

By Clyde H. Schuyler, D.D.S., New York, N. Y.

THE restoration of maximum oral function in a manner that will aid in maintaining oral health should be the first concept of every dentist in fulfilling his responsibility to his patient.

The semi-edentulous mouth presents to the dentist one of his most complex problems. Fixed restorations supplying one, two or a greater number of teeth have served more adequately in maintaining oral function and health than the removable partial appliance as commonly planned and constructed.

The rendering of an effective removable partial denture service is possible only when conscientious thought and consideration are given to anatomy, physiology, pathology, art and mechanics. In addition to this, one needs to possess that digital dexterity and judgment which are acquired only by a recognition of errors and pitfalls and a desire to render a more efficacious service.

A carious tooth is not restored and its usefulness maintained for an unlimited period of time without planning and careful operative procedures. The same is true of restoring the lost tooth with a fixed bridge. An inlay supplying a definite lug rest may be the simple factor necessary to the success of a partial denture and the maintenance of oral health and function. Yet because it entails additional preparatory work and a so-called restoration is possible without it, this small amount of extra preparatory work is too often neglected.

It would seem that what in past years was known as partial denture service was cursed by neglect and, in some instances, I am inclined to believe, lack of sincerity on the part of those responsible for planning the dentures. In recent years, however, greater interest is apparent in the improved service rendered by a great percentage of dentists, and there is every reason to believe that the removable partial denture will soon be recognized by all for its true value as an efficient means of restoring oral health and function, perhaps for a longer period of comfort and efficiency than may be expected of the large fixed bridge or the full artificial denture.

A reasonable expenditure of time in diagnosis and treatment planning of a partial restoration is most profitable to both the dentist and the patient. X-ray films are necessary to determine the value of teeth as abutment supports and to determine the ridge or tissue support offered. Study casts, accurately reproducing oral conditions and mounted on an adjustable instrument reproducing centric and eccentric occlusal relations, are essential in planning the type of prosthesis that will serve most efficiently and the oral preparatory work essential to the success of the restoration.

Most often, the loss of a large number of teeth is accompanied by the loss of the normal maxillomandibular relation. Much has been written in recent years relative to the closed or otherwise abnormal jaw relation and its influence on

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heretofore unexplained cases of so-called facial or glossopharyngeal neuralgia, ringing or low buzzing in the ears and head; pain, at times in and about the ears; headaches, which may be severe and constant; a burning sensation of the tongue, throat or nose; dizziness, at times of prostrating severity, and alleged sinus symptoms and dryness of the mouth, all of which may be due to an excessively closed jaw relation or disturbed function of the temporomandibular joint.

The realization that oral infection might seriously affect the general health placed an added responsibility upon the dentist and has had its influence upon dental education. While not all of these conditions are related to dentistry, patients who need removable partial dentures are seldom free from abnormalities of occlusion that might be a contributing factor in the conditions mentioned. The dentist's responsibility in recognizing such conditions as may be related to occlusal abnormalities and in establishing and maintaining an innocuous occlusal relation is of paramount importance in a health service.

In planning the partial denture, after the desired maxillomandibular relation has been established and occlusal adjustments have been made, thought must be given to the minimizing of occlusal stress and its broadest possible distribution. That a limited degree of tissue stimulation is conducive to tissue health is a known fact. That overstimulation causes tissue destruction is also true.

The dentist need not worry about the possibility of obtaining the limited stimulation essential to tissue health. His problem is to avoid the destructive effects of overstimulation.

Functional stress may be reduced by reducing the buccolingual dimension of posterior teeth and by increasing the sharpness of cutting tooth surfaces. In some instances, it may be reduced by placing a limited number of teeth upon a prosthesis.

Unfavorable lateral stresses may be lessened by reducing lateral cusp inclines. This should be determined in the study of preliminary casts, as corrective or constructive work on the natural teeth may be necessary before final casts are made.

Stress may be most favorably distributed by making use of the available natural teeth and the maximum tissue-bearing area as a combined support for the prosthesis. The use of only tissue support or only tooth support may cause overstimulation and destruction of the supporting structures, while the stimulation associated with the combined support may fall within the limit of tolerance, resulting in no destruction.

The opening of the maxillomandibular relation, upon a partial prosthesis with the natural anterior teeth out of central relation contact, should be avoided when possible, as the greater distribution of occlusal stress obtained when anterior tooth contact is available may avoid overstimulation and destruction of the teeth and tissue supporting the denture. The placing of pinledge castings upon the lingual surface of at least the upper cuspids, preferably the six upper anterior teeth, is often a simple means of maintaining the maximum centric relation contact.

Nature designed the tooth to withstand stress parallel to its long axis. A continued lateral stress is sure to cause alveolar resorption and tooth movement. A vertical force applied upon an inclined plane transmits a force at right angles to the incline.

We all recognize the power of the wedge. The use of lugs upon the lingual incline of any anterior tooth has a wedging effect between it and other anterior or posterior teeth. A partial denture with lugs upon tooth inclines, in a manner to produce wedging, is sure to produce tooth migration and cause the

destruction of the alveolar support of abutment teeth. Normal saddle adaptation is not maintained and irritation and absorption of tissue-supporting areas result. These changes also introduce occlusal anomalies and their associated injuries.

Herman E. S. Chayes recognized the precision attachment as the most effective means of supporting a removable partial denture, with the minimum destruction of supporting tissue. In this principle, I am glad to support him. However, he contended that the clasp appliance bound the teeth together too rigidly, and that the clasp did not permit the tooth the freedom of movement or normal stimulation essential to health; these being the virtues of the precision attachment. In this, I cannot agree with Chayes. When the precision attachment is used, occlusal stresses are directed most favorably, that is, more nearly parallel to the long axis of abutment teeth, and lateral stresses are distributed more evenly between all abutment teeth than is possible with the comparatively flexible clasp. The clasps do not present the same possibility of tying the abutment teeth together in the rigid manner in which they are united when the slot attachment is used. It is this definite distribution of applied force and reduction of mobility that have minimized stimulation and resultant destructive tissue changes.

Fortunately, the slot attachment does not lend itself to all the varied forms and gross abuses of construction as does the clasp. The term "precision" is very appropriate as its use requires definite oral operative procedures, and the incorporation of definite principles such as parallelism of attachments, and rigidity of connectors in the mechanical construction.

There is, however, a place in dentistry for the removable denture with clasps. Its use does not involve so great an expenditure of time and money as does that of the precision attachment denture. We must, however, endeavor to incorporate into its construction, as far as possible, the virtues of the precision attachment denture. To do this, definite lug seats must be prepared upon each tooth where a lug is to be used. If a definite lug seat is not possible without the inlay, insertion of an inlay should never be neglected. Wherever such a wedging force exists, oral health and function cannot be maintained. Clasps and bars connecting abutment teeth must be so constructed that the maximum distribution of horizontal forces is obtained.

Today, there is much controversy relative to the comparative merits of the circumferential clasp and the bar clasp. In comparing these two forms of clasps, we must recognize that the clasp serves two distinct purposes. First, it serves as a retainer for the prosthesis. Too often, this is the only function given consideration by the dentist. Of equal and sometimes of greater importance is the distribution of lateral forces.

The bar clasp contacts the tooth at the end of the arm or the point of its maximum flexibility. The circumferential clasp made from 12 or 14 gage half-round wrought wire and properly tapered is sufficiently flexible for practical purposes and, if properly placed, gives adequate retention in a vast majority of cases. At the same time, the first half of the clasp arm is sufficiently rigid to more favorably distribute lateral forces among the supporting abutment teeth. The bar clasp may serve better as a retainer, with less show of gold in exceptional cases. The one piece casting is the more simple and a time-saving procedure requiring less technical ability, but to me all of these virtues are overshadowed by the value of the stress distribution, the greater immunity to distortion and the adaptability or adjustability of the wrought clasp.

Saddle extension and adaptation are

of great importance in the distribution of force. The maximum degree of buccal extension and border fulness is not so essential in an upper partial denture as it is in the lower restoration having no posterior tooth support. This difference in tissue support leads me to use the metal base in most maxillary restorations, while the metal base is never used in the construction of the partial lower denture with the free-end saddle. In fact, it is impossible to get the full value of the mandibular ridge support which requires the maximum buccal extension and fulness with the metal base. The rigid metal lingual bar is used, while the saddle areas are made entirely of denture base material, such as vulcanite, luxene or the acrylic resins. These materials are favored also because they are easily relined.

In the past years, many commercial organizations, laboratories and manufacturers of metals have sponsored so-called educational campaigns. They have employed men of unusual intelligence who profess a knowledge of the partial denture problem, yet a vast majority of their designs at commercial exhibits, in advertising circulars or in the advertising pages of our literature show rests placed upon lingual inclines of anterior teeth, without definite lug seats, and the partial lower denture with the narrow metal base. These are two cardinal errors in partial denture design that should be readily recognized by all and corrected if they sincerely desire to aid in rendering a more effective partial denture service.

Rigid palatal and lingual bars are essential in bilateral appliances if the maximum distribution of lateral stress is to be obtained. The rigid bar has been commonly used with the precision attachment to avoid wedging of attachments while the precision attachment case is being inserted or removed. It was found also that inlays carrying the boxings were less often displaced when rigid connecting bars were used, this being due to the bilateral distribution of stress and reduction of torque.

In the construction of the clasp appliance, connecting bars are often too flexible to be of great value as a means of obtaining bilateral support of abutment teeth. The wrought wire connectors have often been advocated, while the rigid cast bar would be more serviceable. In the upper appliance, the double palatal bars placed upon the anterior and posterior incline of the vault give greater rigidity in proportion to their bulk and weight than the single bar, as it employs the principle of the T beam.

The stressbreaker may be favorably used in some instances to avoid the force of torque or leverage upon an abutment tooth. Its use is not so essential with a clasp retained appliance as with the appliance retained by precision slot attachments. An indication for their use might be the partial denture with a free-end saddle, such as the appliance with no posterior tooth support. In this instance, the pump handle effect upon the anterior abutment would be greater when the precision attachment was used as a retainer than when the clasp was used. The leverage upon the abutment tooth would be related to the value of ridge support and the accuracy of saddle adaptation, a firm ridge with a large area of support always being more favorable than the spongy compressible ridge of limited area. A poorly adapted saddle, or one not accurately related in assembling, places unnecessary strain upon abutment teeth. A stressbreaker is always a compensating factor in the carelessly assembled case; but that is a poor excuse for its use.

A stressbreaker that permits the settling of an appliance may defeat our desire to maintain a combination tooth and tissue supported appliance. If a stressbreaker permits excessive mobility, the supporting tissue may be overstimulated, unnecessary tissue resorption

resulting, with loss of saddle adaptation and added strain upon abutment support.

The tissue support of the maxillary ridge might be compared to that of the mandible. The lower ridge in the region of the bicuspids is comparatively narrow. It is of cancellous bony structure and will not tolerate excessive stresses. From the region of the first molar to the ramus, we are able to cover a broad flat area on the dense bony structure of the mandible, the most favorable stress-bearing tissue in the mouth. The maximum available area should be used. In the bicuspid region, in dimension the occlusal-surface area may approximate the tissue-bearing area; while from the second bicuspid, distally, the available tissue-bearing area may be many times greater than the occlusal surface area of the molars. Overstimulation and resorption would be expected in the bicuspid region of a tissue-borne appliance, while little or no change would be produced in the distal portion of the saddle-bearing area. Lugs placed upon definite lug seats of the anterior abutments might so distribute the bicuspid load as to avoid overstimulation of the bicuspid ridge or the anterior tooth support. The lug gives support to that area where support is needed. This appliance may be worn for years with little or no change, maintaining established occlusal relations; while a tissue-borne appliance or an appliance with a flexible stressbreaker placing added stress upon the ridge in the bicuspid region might cause resorption of the ridge and eventually destruction of the anterior abutment. Ridge stimulation is reduced also by maintaining the most accurate lateral relation between the ridge and saddle at all times. For these reasons, I never use a stressbreaker with a lower clasp appliance. When saddle support is favorable and accurate saddle adaptation is obtained, I see little need for the stressbreaker with the precision attachment. If used, the stressbreaker should function only to eliminate a pump handle strain upon the anterior abutment. Again, I repeat, that I would never use the all metal base in this case.

The maxillary ridge-bearing area from the bicuspid to the molar is all more or less the same type of bony structure, the upper bicuspid region more favorable than the lower bicuspid region and the upper molar region less favorable than the lower molar region. A stressbreaker that avoids any pump handle action on the abutment or places a slightly added load upon the tissue may be favorably used. As buccal border thickness gives little added support, the all-metal base partial upper denture may be used. However, the color, strength and lightness of the newer resins are favorable to their use for attaching teeth to the base.

In conclusion, I beg you to more seriously consider the mechanical principles associated with partial denture prosthesis. Design your appliances upon study casts. Fulfil your responsibility to your patient by supplying your technician with a detailed prescription for him to fill. Unless the fundamental principles discussed are applied in rebuilding the crippled mouth, the maintenance of oral health and oral comfort cannot be expected. In the past years, we have heard much relative to the influence of oral infection upon general health. Not enough has been said relative to the ill effect of oral discomfort upon the central nervous system and its effect upon general health. Many hopeless neurotics will not be restored to health and normal living until they have oral comfort.

400 Madison Avenue.

A SECOND CENSUS OF DENTAL CONDITIONS IN UNIVERSITY OF MINNESOTA FRESHMAN STUDENTS

By PETER J. BREKHUS, D.D.S., Minneapolis, Minn.

IN 1931, we reported before this group, at the International Dental Research meeting in Memphis, a three-year study of the prevalence of dental caries among university freshmen at Minnesota.[1] The dental examination was conducted in conjunction with the general physical examination which every freshman has to take before entering the university. Records of general health conditions, including height and weight, are thus accumulated and become available for periodic comparison. In 1930, we discontinued the annual dental examination, thinking that we had a sufficiently large group (10,445) to give significant evidence of the general trend.

A decade has now elapsed since this study was undertaken—a decade of education and experimentation and intensive research; a decade in which changed social and economic forces may have to be reckoned with in the final analysis of the physical condition.

With the 1927-1930 study as a background and a similar group of students at the same institution available for a similar examination in 1939, we believed that we could obtain some useful information as to the trends in the prevalence of caries in two similar groups examined ten years apart.

In order to reduce the possibility of errors to a minimum, the two studies were conducted in an identical manner. In some instances, we even employed the same examiners in the two examinations, and I had personal supervision of both. In both studies, we examined and tabulated the condition of each individual tooth (third molars excepted) as to extractions, untreated caries, fillings and type of filling materials. Filled teeth, extracted teeth and unfilled carious teeth were classed as affected by caries, the rest as sound teeth. In addition to comparing the prevalence of the disease in these two groups, the information thus obtained gives a basis for the study of trends in dental practice and amount of dental service rendered. The time allotted for this report, however, does not permit me to go into these details. We shall therefore confine ourselves to comparing the prevalence of caries in the two similar groups examined ten years apart. In the accompanying table, we have the 1929 and 1939 groups so arranged that a comparison of each individual tooth can easily be made.

In the 1929 group, we examined 3,388 students: 1,976 boys and 1,412 girls. In 1939, we had a group of 4,348 students: 2,677 boys and 1,671 girls.

To our surprise, we found in comparing the two groups that there has been a considerable increase in caries frequency in the posterior teeth of the 1939 group, the greatest increase appearing in the second molars of the upper jaw. Another increase, but one of less magnitude, appeared in the first molars and in the

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PERCENTAGES OF PERFECT TEETH FOUND IN FRESHMAN STUDENTS AT THE UNIVERSITY OF MINNESOTA IN 1929 AND IN 1939

Men

	1929: Number of Students, 1,976							1939: Number of Students, 2,677						
	Upper Left							Upper Right						
% Perfect	7	6	5	4	3	2	1	1	2	3	4	5	6	7
1929	50.65	21.37	66.61	69.10	92.51	75.29	74.04	72.49	73.43	92.90	70.20	64.01	21.00	45.69
1939	21.56	13.22	57.94	62.47	91.33	71.91	71.72	71.57	71.69	91.30	60.85	55.77	13.14	24.02
Diff.	−29.09	−8.15	−8.67	−6.53	−1.18	−3.38	−2.32	−0.92	−1.74	−1.60	−9.35	−8.24	−7.86	−21.67
	Lower Left							Lower Right						
1929	30.60	16.55	70.39	88.26	97.66	96.95	96.55	97.04	96.62	97.49	88.97	69.72	18.04	34.47
1939	16.74	10.36	64.18	85.77	97.80	97.31	96.63	96.83	97.43	97.75	85.51	63.29	9.79	17.33
Diff.	−13.86	−6.19	−6.21	−2.49	+0.14	+0.36	+0.08	−0.21	+0.81	+0.26	−3.46	−6.46	−8.25	−17.14

Women

	1929: Number of Students, 1,412							1939: Number of Students, 1,671						
	Upper Left							Upper Right						
1929	30.69	15.78	59.47	63.98	90.36	71.00	68.47	70.37	73.17	92.52	65.07	62.61	9.50	23.14
1939	15.26	14.78	52.17	59.71	87.73	71.33	68.10	68.64	73.25	88.45	58.65	50.08	10.17	17.60
Diff.	−15.43	−1.00	−7.30	−4.27	−2.63	+0.33	−0.37	−1.73	+0.08	−4.07	−6.42	−12.53	+0.67	−5.54
	Lower Left							Lower Right						
1929	19.32	8.62	63.96	88.51	98.72	98.41	97.31	97.44	97.85	98.65	90.01	67.99	9.36	10.35
1939	11.60	8.01	59.07	84.32	98.07	97.78	97.78	97.72	98.08	98.20	85.57	60.02	8.61	14.12
Diff.	−8.72	−0.61	−4.89	−4.19	−0.65	−0.63	+0.47	+0.28	+0.23	−0.45	−4.44	−7.97	−0.75	+3.77

Perfect mouth condition (males)		Perfect mouth condition (females)		Affected teeth per person	
1929	2.55%	1929	0.81%	1929	9.95
1939	1.34%	1939	0.90%	1939	11.08
Diff.	−1.21%	Diff.	+0.09%	Diff.	+1.13

first and second bicuspids. The same pattern appears in both sexes in both the upper and the lower jaws, with one exception: in the lower right second molar in the female group, we find a slight decrease in caries frequency. No explanation is apparent for this phenomenon. The upper and lower anterior teeth, which are the least susceptible, show very little difference in the two groups, as might be expected.

In comparing the total number of affected teeth in the two groups, we find an average of 9.95 for the students of 1929 and of 11.08 in the 1939 group. On the basis of twenty-eight teeth to an individual, this gives an increase of about 4 per cent. Untreated caries and extracted teeth also show a slight increase in 1939. And whereas we found sixty-one perfect mouths among 3,388 students in 1929, ten years later we found only fifty-one perfect mouths among 4,348 students—only slightly more than one in a hundred.

A statistical check-up has shown that these findings are not due to chance errors. The increase in caries is not in itself very large, but when we remember that the period between the two studies was only ten years, we realize how alarming would be the same rate of increase over a century.

It has been suggested that the recent period of depression may account for this increase in dental caries. This has given us food for thought. If malnutrition is a factor in dental caries, we might also expect a general physical deterioration. We find this to be the case in animal experimentation. Through cooperation with the University of Minnesota Student Health Service, we have been able to obtain height and weight figures for both groups of students. We find that the 1939 group, both boys and girls, were slightly heavier and slightly taller than the 1929 group; but they were also slightly older, so that their greater development may be due to this age factor.[2]

At least we may say that the height and weight figures indicate no downward trend in the physique of these students. Rather they show a tendency, similar to that observed at Dartmouth,[3] Harvard[4] and other colleges, for contemporary students to be taller and heavier than those of previous years. Of course, height and weight are not infallible indices of general health, but in a group of several thousand persons among whom other conditions are held fairly constant, they do indicate whether the trend is up or down. What I should like to emphasize here is that the 1939 freshmen who showed poorer dental health than the 1929 students were apparently not in any worse general health than the 1929 group; in fact, their general health was perhaps a little better.

From these observations, we may be justified in concluding that the thousands of students at this large representative university, most of them in good health, furnish evidence not only that their generally good physical condition is no guarantee of good teeth, but also that the recent intensive dental health education of upper-class American children has had no effect in reducing the prevalence of dental caries. As already stated, in 1939 the average boy or girl entering the University of Minnesota had one more tooth that had been affected by caries than the average youth who entered in 1929. Yet during those years, the children in question brushed their teeth regularly, benefited by modern discoveries in the fields of nutrition and hygiene and had, in nearly all cases, good dental care. It seems, therefore, that something at present beyond our knowledge and control has been attacking their teeth.

Much information on trends in dental caries could be obtained by periodic surveys in similar groups. To my knowledge, the University of Minnesota is the only place where this has been attempted

so far. If such surveys were conducted in similar institutions in various parts of the country, say at ten-year intervals, much could be learned which would be helpful in our search for the cause and cure of dental caries.

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APPREHENSION AND PAIN: THE PRACTICAL INTROSPECTIONS OF A PSYCHIATRIST

By ERIC. L. BERNSTEIN, M.D., and NORMAN FEITELSON, D.D.S., Westport, Conn.

THIS communication is the result of some interesting hours spent by one of us (E. L. B.) in the chair of the other, where an opportunity was had, through intimate contact, to become familiar with the psychologic effects of the dentist's drill. The concomitant introspections and intermittent discussions yielded some ideas which may be of practical interest to the dental profession at large.

The factors which differentiate the work of the dentist on the living tooth from the same work on the isolated tooth are matters of relative convenience, depending on three considerations: anatomic, physiologic and psychologic. Since the physiologic factors (wetness or dryness, etc.) in a large degree, and the anatomic factors (position and steadiness of the head and jaw, etc.), in a lesser degree, depend on the psychologic, and since purely psychologic factors themselves are of more than secondary importance, an understanding of the latter is especially desirable.

There are for all of us two psychobiologic experiences which are in the foreground during any dental operation: 1. The apprehension of pain. 2. The perception of pain. The apprehension of pain is highly, and the feeling of pain slightly, modifiable by purely psychologic measures which can be applied in everyday practice. The remainder—the residuum of pain actually felt—can be controlled by drugs or by other factors of operative technic, such as temperature control and the use of sharp instruments.

The apprehension of dental pain depends primarily on general conditions. When a sharp instrument is put in the mouth, especially when its potential painfulness has been previously proved by experience, there is a universal impulse to avoid the threatening instrument, by flight from it or by destroying the agent who wields it. The individual usually inhibits this impulse, so much so that, in most cases, it does not even reach the level of conscious attention, and the head and hands are kept immobile as a matter of course. There are two cases, however, in which this is not so.

In the first, the impulse is no stronger than usual, but the inhibition is weaker. The patient either has never been taught to inhibit his impulses as a child or he

is psychologically unable to do so. Other things being equal, the properly brought up child will be an easier patient to work with than the poorly trained child. The hysterical personality, however, may have had proper training, but is incapable of practicing what he knows is right, because it is less important to behave properly than to protect himself from pain, or attract attention and impress upon the dentist the fact that he is dealing with a delicate and important organism.

The second case pertains to the individual whose inhibitions are as strong or slightly stronger than the average, but whose impulse is much stronger than the average; i.e., he is constitutionally more apprehensive than most people. Such persons know that they should behave, and they try to behave, but they are overwhelmed by apprehension through no fault of their own.

The apprehension of pain depends secondarily on certain specific conditions. There exist in all of us the germs of certain mental attitudes of whose existence we may normally be quite unaware. Two of these attitudes which play a prominent part in apprehensiveness in the dental chair are the fear of points and the awe of machinery and of energy emanating from an invisible source. Every person displays these two attitudes, but to different degrees. In predisposed persons, they may even emerge as full-blown mental symptoms. In its most florid intensity, the fear of points appears as pathologic fear of sharpness, so that even the sight of a sharp object, or anything associated with cutting, may cause the most intense panic and agitation, with an impulse to flee or destroy the offending object. A pathologic awe of machinery and invisible energy is a frequent element of paranoid conditions, wherein the individual, for no apparent reason, senses on all sides mysterious machines from which energy emanates to destroy or influence him. Any germ of this fear of points and this awe of machinery present in normal persons is stimulated to activity in the dentist's chair, and this may profoundly affect his conduct there. The patient's sensitivity is enormously enhanced by the fact that he knows that the dentist is actually going to penetrate his tissues with the instrument; while the machine actually stands ominously before him and the mysterious vibrating energy is actually going to be applied to his body. It is in every case a triumph of civilization if he can sit still and let the dentist proceed in the face of his strong conscious or unconscious resistance.

The apprehension of pain, then, may reveal itself to the dentist and interfere with his work in gross or subtle ways. The patient may give way to primordial impulses of self-protection completely, and withdraw violently from the drill; or, in rare cases, he may take the other extreme and assault the dentist.

Next in order of inconvenience to the operator is the patient who exercises some restraint, but still gives motor expression to his protective impulses indirectly, by threshing or jerking or simply moving his arms, legs or other parts of his body not directly concerned with withdrawal of the mouth or removal of the feared instrument.

A stage higher in the scale is the person who is able to inhibit all voluntary motor activity, but cannot inhibit his autonomic nervous system, so that he spurts saliva, interfering with the operator in that way.

Most accommodating of all are the patients who inhibit both motor and secretory activity, and simply experience apprehension without giving external evidence of it which might interfere with the work of the operator. Even these people, however, will often give evidence of their apprehension by increased muscular tension, which the operator may sense more or less vaguely.

It may happen, in rare cases, that apprehension and tension are almost completely absent even after previous experience with the drill. This is most likely to occur in very dependent people, especially women, in whom the feeling of "being taken care of" by a "strong, competent individual" upon whom they can lean emotionally outweighs the fear of pain.

As a matter of psychic economy, it might be expected that those patients who actively express their tension in the office will be much less tense after leaving the office, while those who give no external evidence of it in the chair will have to find an outlet for it later. There is some evidence that this is actually the case.

The actual perception of pain depends on individual susceptibility. The less the dental receptors are irritated, the less the pain felt. In practice, the operator is more interested in how much the patient reacts to the pain than in how much pain he experiences. This includes not only immediate reactions, such as moving, but also long range reactions, such as going to another dentist by whom he is hurt less. But it is to be emphasized that many people, and perhaps the majority of anxious people, are more influenced by apprehension than by actual suffering.

How, then, can the dentist reduce the apprehension of pain and the amount of pain felt (through other than pharmacologic measures), and thus minimize the psychobiologic and psychomotor reactions which upset him and the patient?

Naturally, the man who has psychologic intuition will attain these results better than the man who is exclusively a technician. The intuitive dentist will size up every patient and adjust his manner of approach and his technic to fit the man in the chair, perhaps entirely without conscious analysis. Such intuition is developed by experience, so that, other things being equal, the old dentist will handle his patients better than the young one. But conscious analysis is at least as valuable as intuition and experience.

The basic consideration is the general mood and condition of the patient. The same patient will react better at one time than at another. Only general principles can be laid down, to which there will always be exceptions, if only for the reason that one cannot know all about every patient. But the more one knows, the more accurate will be one's insight.

If a patient is well, if he is happy, if he has just eaten a good meal, if he is slightly somnolent for this or for some other reason, he will be easier to handle. This means that the most apprehensive patients should be seen at the time of day when in their natural mood cycle they are at their best. Some people are happiest in the morning, some in the late afternoon or evening. If they are seen after a good meal, they will usually be easier to handle than if they are hungry. If they are rested, they will react better than if tired. It is necessary to distinguish between fatigue with tension, which will increase apprehension, and the postprandial somnolence mentioned above.

The second consideration is the factor of attention. Where there is no attention, there can be no apprehension. If the dentist can distract the patient's attention from the instruments by discreet, well chosen (and not too profuse) conversation, the patient's apprehension will be reduced in the same proportion.

Regarding this distraction of attention, one may make two generalities: 1. The more the dentist knows about his patient, the better he will be able to attain this end. 2. The more warm and dignified his relationship to the patient, the better will he be able to distract the attention. If, on the other hand, the patient knows too much about the dentist, or has seen him in an undignified situation, distraction of attention will be more difficult

because of lessened confidence. Some dentists may have learned this from working on members of their family or on schoolmates.

The third consideration is the factor of suggestion. The instruments should be displayed as little as possible, but the patient should not be allowed to suspect that a deliberate attempt is being made to conceal the "weapons" from him, or he may fear the worst. There should never be an array of sharp steel under his eye, and for this reason it is not unwise to have the sterilizer behind the chair, well out of his field of vision. Inquiries about pain should be sympathetic and adequate to protect the patient from injury, but should not be so frequent as to keep him in a continual state of watchfulness unless this is technically necessary. The question of how to warn the patient about impending sensations is a delicate one, and the exact phraseology should be chosen from experience with the individual case. In general, it is wise to avoid the word "hurt" and substitute "bother." The amount of pain that the dentist expects the patient to feel should be minimized, but only to an extent compatible with retention of the patient's trust. One should never say confidently and without qualification "This will hurt." The patient will then be only too sure that it will hurt. "This will probably bother you a little" would seem to fulfil all the requirements. If this particular wording is used, the patient will probably forgive the understatement, while, at the same time, the dentist has reduced the element of suggestion by avoiding direct statements.

The fourth consideration is the factor of technic, and here the almost universal, though sometimes unconscious, tendencies to fear points and to stand in awe of machinery are important. Although again we are dealing with general principles to which there will always be exceptions, unless the patient definitely states otherwise it is safe in the beginning to assume (1) that people are more afraid of points than of edges, especially edges that are not especially knifelike, and (2) that the faster a machine goes, i.e. the more power behind it, the more awe and apprehension it will elicit, especially when it is causing not only pain, but also direct vibratory sensations to the very receptive tissues of the head.

To the psychiatrically minded dentist, the implications will be simple, particularly when he is dealing with children or anxious or hysterical adults. He will never drill when he can use handcutting instruments, and he will run the drill as slowly as is compatible with expediency. As a corollary, he will never do anything by machine which he can do as well by hand. By adhering to these principles, he will, in most cases, reduce apprehension and make the operation easier for himself and for the patient. He will remember that, with an apprehensive patient, it is more important to reduce apprehension than to reduce the actual amount of pain. Thus, in some cases, even though cutting may be the more painful procedure, the patient may be less disturbed by it than by drilling.

THE JOURNAL *of the*
AMERICAN DENTAL ASSOCIATION

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ARE OUR EDUCATIONAL STANDARDS TOO HIGH?

As a result of the defense measures which have been forced upon this country because of the war conditions in Europe, the man-power facilities of the dental profession have been severely taxed and the profession has been forced to give serious consideration to ways and means of augmenting the physical forces of dentistry.

During the depression and in the recovery period which followed, the fact that the number of dentists was yearly decreasing seemed not to cause any large measure of anxiety. In fact, in the depression days, to judge from the demand for dental work, there seemed to be too many dentists; and, in the years that have followed the depression, the profession has been so busy mending its fences economically that the steady decrease of man-power has not apparently caused any great perturbance. In educational circles, however, the question of maintaining the proportion of dentists to the increasing population has been of much concern. The need is now accentuated by the demands of the government upon the profession, and an attempt is being made to devise and study ways and means of increasing our numbers, not only to care for the

present demands of the Army and the public, but also to forestall any likelihood of deficiency in the future.

This distressing tendency toward a decrease in dental personnel has been apparent to the journalistic eye that attempts to see the trends in dentistry and to offer suggestions for either remedying or preventing a distressful condition. To one of our contemporaries, the question has assumed a most serious aspect; in fact, so serious that he metaphorically envisions a vanishing profession.

In a more modest degree, we share his apprehension, but take heart in the active interest which the Council on Dental Education of the American Dental Association is exhibiting in the subject. It should be borne in mind, however, that the Council is primarily concerned in maintaining and even raising educational standards, which already appear to some to be disproportionately high.

Many have had mental forebodings that the constant elevation of the educational standards has been the main reason for the apparent dropping off in the number of those seeking entrance to the profession, and we are frank to admit that we also have experienced some anxiety along this line. Among the many questions that we hope to have answered by the Council, this is one that has already been taken under consideration, if not answered.

Contrary to the belief that the high standards have prevented many from seeking dental education, the Council has found that, in the past year, about nine hundred prospective students made application for entrance to the dental course, but were rejected by the various schools, and the grounds for rejection were not insufficient preliminary educational qualifications. It is not true, then, that all who apply to the dental schools are accepted with open arms. It certainly is a credit to the integrity of those who control the influx of students into professional training that their standards for student selection have been steadfastly maintained even though elimination of a large number of prospective matriculants was involved. It demonstrates forcefully that those who are more or less directing the destinies of dentistry are concerned regarding qualifications for entrance into dentistry other than the attainment of academic requirements.

The question of attracting students to the profession is one that long has given concern to those who are interested in the educational phase of dentistry, and we understand that the Council and nearly all dental educators are endeavoring to devise some plan for attracting a greater

number of desirable students to dentistry. We have been so busy in the past elevating the educational standards and adjusting our educational system to these elevated standards that we have lost sight of the relation of output to need.

While economic and political conditions have been more unfavorable to adjustment to the latest increase in educational requirements, we are encouraged by past performances to believe that a return to normality of output will not be too long delayed.

Beginning in 1924, with the increase in educational requirements to one year of academic preparation and four years of professional study, the number of graduates has steadily decreased until, this year, a new low mark in comparatively normal times will be reached. This low mark, however, represents the first class of graduates required to have two full years of academic education plus four years of dental instruction, and naturally a small registration would be expected under the highest requirements yet enforced. Now Harvard comes forward with a curriculum in which another year of professional education is required.

In the May issue, we published the new dental register compiled by the Council on Dental Education, based on the survey inaugurated by the Council, which constitutes a study of dental educational methods upon the aggregate results of which the most modern system of dental education will be projected.

The study of the degree qualifications of those who teach dentistry, as well as those who are prospective students, shows a remarkable advance from the standards of thirty years ago, and the high quality of the graduate dentist is becoming agreeably and encouragingly evident to those who have stood for high entrance standards. The ease with which these high standards have been attained has done more than anything else to reassure university authorities of the worthiness of the dental profession's desire and its eligibility to be included as a unit in the university educational system. Dental education is as truly a university function as is any other phase of health education.

Our next and greatest hope for dentistry in the present trend is that there will be developed a system of cooperative health educational effort leading to a system of research effort coordinating all phases of biologic study, to the end that the solution of the etiology of dental caries, the most universal and prevalent disease of human kind, may be reached.

As an indication of the apprehension felt in other than editorial circles, we quote from the conclusions of the secretary of the Council on Dental

Education, after he had made an analysis of the register previously referred to, which are quite pertinent to the question of the decreasing number of dentists:

> It has been estimated by competent authority that about 2,250 new dentists are needed to make up each year for those who are eliminated by death or retirement or for other causes, and to meet the demands of increasing population. The situation with which the profession and the public are confronted this year is a shortage of at least 750 new practitioners to maintain the present ratio of dentists to population. When the number of dentists likely to be called into military training and service is also taken into account, it will readily be seen that the recruiting of more well-qualified students to enter upon the study of dentistry is of very great importance.

The survey of the Council used in compiling the data for the register indicates a ready response on the part of the prospective dental student to the increasing academic predental requirements. Of 7,720 students who enrolled at the beginning of the application of the two-year requirement standard, 3,875 had two years of academic preparation; 1,338 had three years; 223 had four years without a bachelor's degree, and 2,202 were holders of a bachelor's or other degree.

This would indicate a definite tendency to meet the new educational requirements, but the survey also shows a much decreased total number from that of former years.

Encouraged by this educational trend, the Council now proposes to put more emphasis on "the quality of the applicant's scholarship and his personal fitness to undertake the study of dentistry from the standpoint of health, character, professional instinct and aptitude."

The question now confronting educational authorities is to devise ways and means by which dentistry can be made more attractive to the academic student, and inclusion of dental education in the university educational system will, we hope, prove to be one of the means to this end.

BIBLIOGRAPHICAL

Tutkimuksia Silikaattisementtien Taivutuslujuudesta. (Investigations of the Bending Strength of Silicate Cements) By PEKKA NIRONEN, Helsinki, Finland, 1939. Presented before the Golden Gate Dental Congress, San Francisco, 1939. Brochure of 117 pages published in Finnish.

AMONG the properties of silicate cements, the bending strength is of vital importance. The edge strength of the filling and the strength of corner fillings depend entirely on the bending strength. In this investigation, the author endeavors to throw more light on the bending strength of silicate cements and the conditions influencing it, and, at the same time, to suggest methods for the solution of this problem.

For practical reasons, the investigation is limited to three silicate cements of which the author has gained practical knowledge during several years: syntrex, filling porcelain and certified enamel. Tests of strength have been made on dry test pieces and on pieces placed in water. The chief results of the investigation are briefly as follows:

1. The bending strength of silicate cements, when dry, is considerably greater than it is when they are wet. The cement absorbs water and it changes the nature of the cement so as to lessen its strength. If the water filled only the interspaces, its presence should not impair the bending strength.

2. The rapidity of the setting of cements is a decisive factor in the success of cement work. The bending strength increases with the increase of powder in the cement mixture. However, as the setting process is accelerated in the same ratio, the time of work is shortened and the success of the work becomes uncertain. A higher temperature also accelerates the setting and thus shortens the time of work.

3. The bending strength of a cement specimen made by modeling is generally greater than that of an object prepared under pressure. Pressure exerted on cement during the setting process causes internal motion, and consequently a decrease in firmness. With slowly setting cement mixtures, pressure does not have such an adverse effect as with thick and quick setting mixtures.

4. Filling porcelain includes a constituent that absorbs water easily, this impairing its bending strength in water, though improving it in a dry condition. In certified enamel, the same condition is observed, but it does not appear so clearly. In syntrex cement, this quality is not observed.

Exodontia

By M. HILLEL FELDMAN, D.D.S. Director of Dentistry, Lincoln Hospital, Department of Hospitals, City of New York. Edition 3. Cloth. 280 pages with 217 engravings. Price, $4. Philadelphia: Lea and Febiger.

THE author presents in this volume his methods of extracting teeth and of removing impacted teeth, and, briefly, the care of certain other conditions associated with the removal of teeth. To this end, the volume begins with sections on selection of the anesthetic, preparation of the patient and the other important details of carrying out an operative procedure. An account is given of the author's position as regards immediate extraction of acutely infected teeth, with his reasons for his position. The major portion of the book is devoted to the forceps and elevator technic for the removal of normally and abnormally situated teeth and embedded roots. Essentially, the author prefers to expose embedded teeth by removing overlying bone with a bur, elevating the tooth, if possible, or sectioning the tooth rather than cutting obstructing bone. The methods advocated are sound. There is a short section on operative accidents and postoperative considerations, and the volume closes with a chapter on dental jurisprudence, by Michael A. Hayes. In summary, this volume is an eminently practical exposition of the author's technic for removing teeth. The methods utilized may differ from those of other persons, but it is evident that the procedures

recommended for removal of teeth are safe and sensible.

Handbook of Anaesthetics

(Formerly Ross and Fairlie.) Revised by R. J. MINNITT, M.D., D.A. (R.C.P. & S. Eng.) Lecturer in Anaesthesia, University of Liverpool, Director of Anaesthetics, David Lewis Northern Hospital, Liverpool, etc. Edition 5. Cloth. 353 pages. Baltimore: The Williams and Wilkins Co., 1940.

THIS handbook is a fairly complete review of the physiology of anesthesia, together with details of the technical procedures useful in inducing and maintaining anesthesia by the many available methods. The first three chapters are concerned with the physiologic changes induced by general anesthesia. The following sections take up in sequence the various methods of using general anesthetic agents, with short discussions of their chemical properties and physiologic reactions. Finally, several chapters are presented on local anesthetics and on spinal anesthesia. Certain differences in technic and custom between the continental methods advocated in this handbook and those in use in this country will be apparent. For example, considerable space is devoted to the use of ethyl chloride both for short anesthetics and in combination with other anesthetics. In spite of these minor deficiencies, this volume should prove to be useful for teaching or for refresher courses in general anesthesia.

Prescription Writing and Formulary for Dentists

By L. RICHARD CIPES, Rh. G., D.D.S., Attending Dentist, New York City Department of Health, Attending Dentist, Mt. Vernon, New York Department of Health. Cloth. 222 pages. Brooklyn: Dental Items of Interest Publishing Co., 1941.

THIS new book consists of three essential parts: the first, on dental materia medica and therapeutics, the second on methods of prescription writing and the last on dental remedies and formulae and their uses in oral diseases. This volume, then, presents the information necessary for the correct prescribing of drugs, indications for the use of certain drugs and a number of suitable prescriptions. The technic of prescription writing is fully described. Both the apothecary and the metric systems are used in preparation of prescriptions. It would probably have been advisable to include quantities of drugs in both systems for convenience in prescribing. The book may serve as a suitable textbook or reference book for this field of dental practice.

The Avitaminoses

By WALTER H. EDDY, Ph.D., Professor of Physiological Chemistry, Teachers College, Columbia University; and GILBERT DALLDORF, M.D., Pathologist to the Grasslands and Northern Westchester Hospitals, Westchester County, New York. Edition 2. Cloth. 473 pages. Price, $4.50. Baltimore: The Williams and Wilkins Co., 1941.

THIS volume presents a comprehensive picture of the state of knowledge of the vitamins and the clinical manifestations of their deficiencies. After several brief chapters on the relationship between diet and disease, the chemical composition of the vitamins and the biochemical action of the vitamins, each vitamin is discussed from several general standpoints. First, the nature and function of the particular vitamin are described. Following this is a section devoted to the pathologic changes or alterations in functions occurring in specific vitamin deficiencies. Following each chapter is a bibliography covering the material cited in the section. Much of the work cited is, of course, culled from the nutritional laboratory's experimental data, but, throughout, a commendable attempt is made to bring clinical problems into the discussion. It is interesting that the processes of tooth development have played such an important rôle in the acquisition of information concerning the effects of vitamin deficiencies on the experimental animal. The last section of the book is devoted to laboratory tests which are of value in the clinical determination of vitamin deficiencies. There can no longer be any doubt that the nutrition laboratory has bountifully contributed to the understanding and treatment of many of the bizarre clinical pictures seen. It is not too optimistic to believe that considerable progress will be made in the future on other problems of nutritional etiology. This book can be heartily recommended to those desiring a complete review of the status of the vitamins.

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President's Page

To the Members of the American Dental Association:

BEST wishes for a very pleasant vacation season.

Last month, in my letter, the story of what happened to the "Murray Bill" was outlined, up to and including May 5. As was stated at the time, it was the intention of Senator Murray to have the bill called up for reconsideration on Friday, May 8, that same week, if the War Department did not immediately recognize the injustice of inducting into the Army as privates men of the health professions and, through administrative action, correct this injustice.

Before the date set for reconsideration of the bill by the Senate Military Affairs Committee, the National Headquarters of Selective Service released from the office of General Hershey certain data which seemingly cleared up the status of the dental student and partially solved the problem of the drafted dentist. (For complete details, see page 986 of the June issue of THE JOURNAL.)

It would be folly to say that the American Dental Association is entirely satisfied with the procedure by which the War Department plans to draft the dental practitioners into the Army. The manner in which commissions are made available leaves much to be desired. Most assuredly, certain further considerations must be asked for and must be granted before the draftees and the public can be assured an adequate dental service.

With this partial solution, seemingly, of the dental draftee problem and with the future of the dental student apparently assured, the status of the Murray Bill is at the present time that of pending legislation. The bill will remain in committee until such time as it is demonstrated that the present procedure of Selective Service Administration is effective in providing proper placement of those who are drafted from the dental and medical professions.

During the year, it has been my pleasure to visit thirteen state dental meetings. These visits have made it necessary for me to travel from the extreme southern part of the United States to the far north and from the Pacific Coast to the Atlantic Coast. In each state that I visited, it pleased me to find a great amount of enthusiasm expressed by the individual member for his particular association. This member interest was universal. The members seemingly were interested not in just one subject, but in all phases of association and dental educational activities. The clinics and general sessions were

crowded. In every instance, the essayists told me of their satisfaction in appearing before the large and attentive audiences.

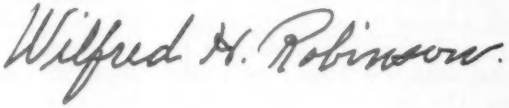
All this desire on the part of our members to attend their annual Association meeting indicates to me, first, a desire on the part of the members to acquire more knowledge in the advanced fields of dentistry; secondly, the fact that the officers of the state societies are taking their responsibilities seriously and are doing a fine job, and, thirdly, the existence of a prosperous, healthy condition in the practice of dentistry.

The membership, without exception, is at a high peak. The reports that I have received from each officer and membership committee chairman encourage me to believe that our quota of 55,000 members will be a reality by the time of the Houston meeting.

Another manifested interest that was extremely gratifying to me was the many commendatory and complimentary statements voiced regarding the improvement in the form and content of THE JOURNAL. Especially were the members enthusiastic regarding that section wherein are found the activities of the American Dental Association. This section seems to fulfil a long felt need.

The fine service being rendered the membership by the Council on Dental Therapeutics and by the Bureau of Standards came in for many complimentary expressions also. If the men who constitute the personnel of these two groups could have heard the many statements regarding the fine services that they are rendering dentistry, they would feel well paid for all the effort that they are making in dentistry's behalf.

Many questions were asked regarding the Houston meeting. If one-half of those members attend who have assured me that their names will be among those registered at the Annual Meeting in Houston, the registration will be the greatest in the history of the American Dental Association.



COMMITTEE ON DENTAL PREPAREDNESS

INASMUCH as there have been some confusion and almost no uniformity in examinations performed by dentists for local selective service boards and at induction centers, the Selective Service administration requested its advisory committee to collaborate with the department in preparing a circular to cover this deficiency, and as a result the accompanying Medical Circular No. 2 was devised.

This is important information for the 8,000 or more dental examiners, the state military affairs committees, others connected with the preparedness program and the profession in general; and the committee is pleased to publish it herewith, with the statement that it believes the plan to be a substantial contribution to the preparedness program of the government.

COMMITTEE ON DENTAL PREPAREDNESS,
C. WILLARD CAMALIER, *Chairman.*

NATIONAL HEADQUARTERS
SELECTIVE SERVICE SYSTEM
TWENTY-FIRST AND C STREETS NW.
March 28, 1941.

STATE DIRECTOR OF SELECTIVE SERVICE.

The purpose of this circular is to guide physicians and dentists in the interpretation of section VII, MR 1-9, to the end that selectees having dental defects and abnormalities will be classified by all local and induction boards in a like manner. The following pages furnish the information relative to the methods utilized and to the interpretation and recording of findings. It is hoped that the examiner will take into account the physical status of the registrant as well as of his teeth, before final classification.

It is requested that copies of this circular be transmitted to your State medical officer and all chairmen of boards of appeal, chairmen of medical advisory boards, chairmen of local boards, examining physicians (medical and dental), and members of medical advisory boards.

Sincerely yours,
LEWIS B. HERSHEY,
Deputy Director.

MEDICAL CIRCULAR NO. 2
DENTAL

NATIONAL HEADQUARTERS,
SELECTIVE SERVICE SYSTEM,
WASHINGTON, D. C.,
March 28, 1941.

GENERAL CONSIDERATIONS

The dentist is primarily interested in the detection of diseases of the teeth, but an intimate association between local diseases of the mouth and those of adjacent parts and general systemic disturbances is equally important. Attention should always be given to the general health of the person applying to the dentist as well as any needed dental restoration, since dentistry of today is considered a specialty of the healing art in which the patient rather than the disease is studied.

Some of the earliest symptoms of infectious diseases first show in the mouth. The deficiency diseases which are due to lack of appropriate vitamins often manifest themselves in the oral cavity by characteristic lesions as in scurvy and pellagra. Such diseases of the blood as the anemias, leucemias, thrombocytopenia, and others, are often accompanied by lesions in the mouth. In many instances the mouth lesions lead to detection of disease in other parts of the body.

Oral sepsis is one of the most prevalent sources of disease. Insofar as the teeth and immediate supporting structures are concerned, the infection may be periapical, periodontal, pericoronal or infection of the dental pulp. Many forms of general systemic disturbances are caused by infections and diseases of the

teeth and mouth. In an oral examination the points that must be constantly kept in mind are (1) the local lesion itself; (2) the possibility that it may be the cause or expression of systemic disease; (3) that it may be the result and the local manifestation of general disease.

The examining dentist should have a clear conception of the normal condition of the mouth and teeth and should detect and record every departure from the normal. A careful survey should be made of the mouth for all defects in teeth, all forms of lesions, stomatitis, tumors, suppuration, apparent oral sepsis, malocclusion, and scars on the lips, tongue, or in the mouth that may be incident to epileptic seizures. Local disturbances found in the mouth are caries, erosion, abrasion, traumatic injuries, resorption, atrophy, mottled enamel, loss of teeth, supernumerary teeth, malocclusion, as well as periodontal disease (including gingivitis, pyorrhea, and periodontal abscess), diseases of the dental pulp, periapical diseases, and others.

There are many forms of stomatitis, such as that due to local conditions, those due to the use of drugs, general systemic diseases, specific infectious diseases, acute constitutional disorders, diseases of the blood and blood forming organs. Other disturbances to be considered are infections of the floor of the mouth and neck, diseases and disturbances of the nerves, lips, tongue, throat, salivary glands and their ducts, maxillary sinus, mandibular joint, muscles of mastication, maxillary bones, fractures of the jaw, tumors, cysts, and congenital deformities of the lips and palate.

MINIMUM DENTAL EXAMINATION

The examining dentist should ascertain the probable number of registrants to be physically examined each week in order that his needs as to time and equipment may be approximated. The examination should be held in a quiet place where adequate lighting and sterilization are available.

Dental requirements set forth in section VII of MR 1-9 published in volume VI of the Selective Service Regulations should be observed in accordance with the interpretation set forth below in bold face type following the various paragraphs of the regulations.

31. Classes 1-A and 1-B.—*a. Class I-A.*—(1) Normal teeth and gums.

(2) A minimum of 3 serviceable natural masticating teeth above and 3 below opposing and 3 serviceable natural incisors above and 3 below opposing. (Therefore, the minimum requirements consist of a total of 6 masticating teeth and of 6 incisor teeth.) All of these teeth must be so opposed as to serve the purpose of incision and mastication.

THIS PARAGRAPH PROVIDING FOR A MINIMUM OF THREE SERVICEABLE NATURAL MASTICATING TEETH ABOVE AND THREE BELOW OPPOSING AND THREE SERVICEABLE NATURAL INCISORS ABOVE AND THREE BELOW OPPOSING SHOULD BE INTERPRETED TO REQUIRE ONLY THAT IN THE EXCURSIONS OF THE MANDIBLE THESE TEETH ACCOMPLISH THE FUNCTIONS OF MASTICATION AND INCISION, EVEN THOUGH WITH THE MANDIBLE AT REST IN CENTRIC RELATION THE OPPOSING TEETH MAY NOT BE IN ACTUAL CONTACT, PROVIDED THAT IN THE EXCURSIONS OF THE MANDIBLE OR WITH THE MANDIBLE AT REST THE TEETH DO NOT IMPINGE UPON THE SOFT TISSUES AND, FURTHERMORE, THAT THE FAILURE OF EXACT OCCLUSION HAS NOT RESULTED IN SECONDARY PATHOLOGICAL CONDITIONS.

(3) *Definitions.*—

(*a*) The term "masticating teeth" includes molar and bicuspid teeth, and the term "incisors" includes incisor and cuspid teeth.

(*b*) A natural tooth which is carious (one with a cavity) which can be restored by filling, is to be considered as a serviceable natural tooth.

A TOOTH WHICH IS CARIOUS, WHICH CAN BE RESTORED BY FILLING, IS TO BE CONSIDERED A SERVICEABLE NATURAL TOOTH, UNLESS THE CARIES INVOLVES THE PULP, IN WHICH CASE, BECAUSE OF THE PROBABILITY OF THE DEVELOPMENT OF INFECTION AND PUTRESCENT CHANGES, THE TOOTH SHOULD NOT BE CONSIDERED SERVICEABLE.

(*c*) Teeth which have been restored by crown or dummies attached to bridgework, if well placed, will be considered as serviceable natural teeth when the history and the appearance of these teeth are such as clearly to warrant such assumption.

TEETH WHICH HAVE BEEN RESTORED BY PONTICS OR DUMMIES ATTACHED TO A REMOVABLE OR FIXED BRIDGE WILL BE CONSIDERED AS SERVICEABLE NATURAL TEETH, WHEN THE HISTORY AND CLINICAL APPEARANCE OF THE ABUTMENT TEETH AND THE BRIDGE ARE SUCH AS TO CLEARLY WARRANT SUCH AN ASSUMPTION. A BRIDGE IS DEFINED AS AN ARTIFICIAL REPLACEMENT OF A TOOTH OR TEETH RETAINED BY NATURAL TEETH WHICH ARE USED AS ABUTMENTS AND BEAR ENTIRELY OR IN PART THE STRESS OF MASTICATION. A FIXED BRIDGE IS AN ARTIFICIAL REPLACEMENT OF A TOOTH OR TEETH, THE ABUTMENTS OF WHICH ARE CEMENTED TO NATURAL TEETH USING CROWNS OR INLAYS AS ABUTMENT PIECES. A REMOVABLE BRIDGE IS AN ARTIFICIAL REPLACEMENT OF A TOOTH OR TEETH WHICH CAN BE REMOVED AND REPLACED, WHEN DESIRED, BY THE INDIVIDUAL, AND WHICH IS RETAINED BY MEANS OF CLASPS WITH RESTS AND/OR SPECIAL PRECISION ATTACHMENTS TO THE ABUTMENT TEETH WHEREIN THE STRESS OF MASTICATING IS BORNE PARTIALLY BY THE ABUTMENT TEETH AND PARTIALLY BY THE SOFT TISSUES OF THE MOUTH.

(*d*) A tooth is not to be considered a serviceable natural tooth when it is involved with excessively deep pyorrhea pockets, or when its root end is involved with a known infection that has or has not an evacuating sinus discharging through the mucous membrane or skin.

PYORRHEA IN ITSELF IS NOT NECESSARILY A CAUSE FOR REJECTION. THE WORDS "EXCESSIVELY DEEP PYORRHEA POCKETS" SHOULD BE GIVEN THE FOLLOWING INTERPRETATION: ON A MULTI-ROOTED TOOTH ANY PYORRHEA POCKET WHICH IS SO DEEP THAT IT INVOLVES THE BIFURCATION OF THE ROOTS IS AN EXCESSIVELY DEEP POCKET. PROPER EXAMINATION BY MEANS OF AN EXPLORER WILL DISCLOSE THIS FACT IN MANY CASES. ON THE OTHER HAND, A SINGLE-ROOTED TOOTH WITH A POCKET REACHING TO THE APICAL THIRD OF THE ROOT SHOULD BE CONSIDERED AN EXCESSIVELY DEEP POCKET.

b. Class I-B.—Insufficient teeth to qualify for Class I-A, if corrected by suitable dentures.

THOUGH NO INDIVIDUALS ARE NOW BEING INDUCTED FOR LIMITED MILITARY SERVICE, ATTENTION IS INVITED TO THE WORD "CORRECTED" IN THIS PARAGRAPH. THE WORD "CORRECTIBLE" SHOULD HAVE BEEN USED, IN THAT IT WAS NOT INTENDED THAT AN INDIVIDUAL ACTUALLY BE IN POSSESSION OF CORRECTIVE DENTURES IN ORDER TO QUALIFY FOR CLASS I-B.

32. Class 4.—*a.* Irremediable disease of the gums of such severity as to interfere seriously with useful vocation in civil life.

b. Serious disease of the jaw which is not easily remediable and which is likely to incapacitate the registrant for satisfactory performance of general or limited military service.

c. Extensive focal infection with multiple periapical abscess, the correction of which would require protracted hospitalization and incapacity.

d. Extensive irremediable caries.

In arriving at a decision as to final

classification, cognizance should be taken of the size, strength and obvious physical condition of the individual registrant.

METHOD OF RECORDING DENTAL DEFECTS

The results of the oral examination should be carefully recorded in line 4, and line 18 if necessary, of the Report of Physical Examination, DSS Form 200. Complete information should be recorded on both the original and duplicate copies.

In charting, place a circle around carious teeth that may be restored by filling.

(Right)							(Examinee's)							(Left)		
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
16	15	14	13	12	11	10	9	9	10	11	12	13	14	15	16	

Cross out (with an ×) all missing teeth whether or not replaced by bridges or dentures; also line out, by an oblique line (/), nonrestorable teeth.

(Right)							(Examinee's)							(Left)		
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
16	15	14	13	12	11	10	9	9	10	11	12	13	14	15	16	

Third molars that have not erupted are classified as missing, and special care should be taken to see that they are crossed out (with an ×).

Fixed bridges should be enclosed thus —( ). Example:—L5 and 7 are abutments: L6 is a pontic.

Do not rely solely on markings of the chart in line 4 of the Report of Physical Examination, DSS Form 200, to determine classification. It may appear from the chart that the registrant is qualified for Class I-A, but clinical examination may disclose the impossibility of bringing the required number of teeth into functioning occlusion, and vice versa. (See Interpretation of Dental Requirements).

PURPOSELY CAUSED PHYSICAL DEFECTS

If it appears to a local board that a registrant is suffering from purposely caused physical defects which would render him unqualified for military service of any kind, such as excessive extractions, a full statement of the facts (including original DSS Form 200) and the local board's recommendation shall be submitted by the local board to the Governor. If the registrant is capable of any duty at all and the local board recommends his induction, the Governor shall transmit the record to the Director of Selective Service, Washington, D. C. (See par. 340, S. S. Reg.)

It should be borne in mind that penalties are severe against the registrant who attempts evasion, and against any person who may have been a party to or imposed upon or are innocent victims in aiding or abetting such evasions. Dentists may find themselves in an embarrassing position unless their extractions on registrants are protected by roentgenograms or other evidence showing the necessity for their procedures.

COUNCIL ON DENTAL THERAPEUTICS

JOHN ALBERT MARSHALL, Ph.D., D.D.S.

(1885-1941)

ONCE more the Council on Dental Therapeutics sadly reports the sudden passing of an original member of this group. The Council members will miss the reports, discussions and votes of the distinguished member from the University of California. The members of the profession and the public will no longer profit from his active participation in their problems.

When the Council on Dental Therapeutics was established, more than a decade ago, John A. Marshall was selected as a dental member because of his grasp of dental problems, his widely recognized proficiency in dental research and his thorough training in the basic sciences. Dr. Marshall's contributions to dentistry were many, but one of the activities closest to his heart was the work of this Council. To him, the annual meeting with its crowded program and long hours of intensive work was one of the most important events of the year.

Complete devotion to scientific honesty and professional idealism are attributes which the profession requires in its Council members. Added to this are the personal characteristics which the nature of the Council's work requires—a willingness to submerge personal advancement and gain in the anonymity of group action and the courage to cling to an honest and well-founded opinion in the face of criticism. These were John Marshall's characteristics.

ABSTRACT OF FEDERAL TRADE COMMISSION ORDER ON CERTAIN SHAVING CREAMS AND DENTIFRICES

THE Federal Trade Commission ordered four New York companies and certain of their officers selling shaving creams, tooth pastes and other toilet articles to retail dealers to cease and desist from price misrepresentations in the sale of their products.

The respondents are Rex Merchandise Corporation of America, 1170 Broadway, and Peter Meyer, its president; Crown Laboratories, Inc., 48 East Twenty-First St., and Arthur A. J. Weglein, Alexander Hirschbein and Frances Chorba, officers; Sheray, Incorporated, and Wilshire Sales Corporation, 33 Union Square, and William and Anna Scher, their officers.

Commission findings are that the respondents, acting in cooperation, sell their shaving creams and dentifrices in tubes and cartons marked with suggested retail sales prices of from 25 cents to $1 a unit package; that the suggested prices are fictitious as the customary prices obtained by retailers for such products are actually anywhere from 10 cents to 29 cents, and that all of the respondents have known that the prices on the tubes and cartons have not been those at which the articles are customarily sold to the public.

Among the trade names under which the respondents' shaving creams and

dentifrices have been sold, according to findings, are "D.D.S.," "Sheray," "Royal Blue," "Dr. Sachs," Tally Ho," "Scientific," "Paramount," "Royal Crown" and "Her Majesty." (Order No. 3142.)

ABSTRACT OF FEDERAL TRADE COMMISSION ORDER ON HEARST MAGAZINES, INC.

THE Commission orders that Hearst Magazines, Inc., and its officers, directors or representatives, in connection with the offering for sale and distribution of its periodicals, magazines or other publications, and the issuance or authorization of various seals of approval, emblems, shields or other insignia, cease and desist from:

1. Representing, directly or indirectly, that all representations of, and claims made for, products, services or other commercial offerings described in advertisements appearing in any of its periodicals, magazines or other publications are true when any representation or claim contained in such advertisements is not in fact true.

2. Using, or authorizing or allowing others to use, seals, emblems, shields or other insignia, which represent in any manner that any food, drug, cosmetic or therapeutic device has been tested, or tested and approved, by, or at the instance of, the respondent, or any organization owned or controlled by it, or otherwise representing, or authorizing or allowing others to represent in any manner, that any such product has been tested, or tested and approved, by, or at the instance of, the respondent or any organization owned or controlled by it, unless and until the product concerning which such representation is made has, in fact, been adequately and thoroughly tested in such a manner as to insure, at the time such product is sold to the consuming public, the quality, nature and properties of such product in relation to the intended usage thereof and the fulfilment of the claims made therefor in connection with the use of such insignia or representation.

3. Using, or authorizing, or allowing others to use, seals, emblems, shields or other insignia which represent in any manner that any mechanical device or article of household equipment, other than those included in paragraph 2, has been tested, or tested and approved by, or at the instance of, the respondent, or any organization owned or controlled by it, or otherwise representing, or authorizing or allowing others to represent, that such product has been tested and approved, unless and until the product concerning which such representation is made has, in fact, been adequately and thoroughly tested in such manner as reasonably to assure, at the time such product is sold to the consuming public, the quality, nature and properties of such product in relation to the intended usage thereof and the fulfilment of the material claims made in connection with the use of such insignia or representation.

4. Authorizing, using or allowing the use of seals, emblems, shields or other insignia which represent, directly or by implication, that an inquiry or investigation has been made by, or at the instance of, the respondent, or any organization owned or controlled by it, of a service or other commercial offering (not including any product) in connection with which such seal, emblem, shield or other insignia is used, unless and until the respondent has, in fact, made a sufficiently adequate and thorough investigation or

inquiry to assure the fulfilment of the claims made for such service or commercial offering in connection with the use of such insignia or representation.

5. Representing, directly or by implication, that any product, service or other commercial offering advertised in its magazines, periodicals or other publications, or for which the respondent has authorized the use of any seal, emblem, shield or other insignia, is guaranteed by the respondent, unless such guaranty is without limitation, or, if limited, unless all limitations upon such guaranty are clearly, conspicuously and explicitly stated in immediate conjunction with all such representations of guaranty.

6. Authorizing, or allowing others to represent, directly or by implication, that any product, service or other commercial offering advertised in its magazines, periodicals or other publications, or for which the respondent has authorized the use of any seal, emblem, shield or other insignia, is guaranteed by the respondent, unless such guaranty is without limitation, or, if limited, unless all limitations, on such guaranty are clearly, conspicuously and explicitly stated in immediate conjunction with all such representations in the guaranty.

The provisions of the order do not prohibit the use of the word "recommended" on any seal, emblem, shield or other insignia when the product on which the insignia is used has been adequately and thoroughly tested by the respondent in such a manner as reasonably to assure the quality, nature and properties of such a product in relation to the intended usage and when the form of the insignia is readily distinguishable by the consuming public from any seal, emblem, shield or any other insignia bearing any guaranty. (Order No. 3872.)

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following articles in the list of Accepted Dental Remedies.

Anesthetics—Local

Procaine HC1 2%, Epinephrine 1:50,000-Atlantic Manufacturing Corporation.—Each cubic centimeter is stated to contain procaine hydrochloride, 0.02 gm.; epinephrine, 0.00004 gm.; sodium chloride, 0.006 gm.; sodium bisulfite, 0.0015 gm.; in distilled water. Marketed in dentules, 2.3 cc.

Procaine HC1 2%, Epinephrine 1:50,000-Atlantic Manufacturing Corporation.—Each cubic centimeter is stated to contain procaine hydrochloride, 0.02 gm.; epinephrine, 0.00002 gm.; sodium chloride, 0.006 gm.; sodium bisulfite, 0.0015 gm.; in distilled water. Marketed in dentules, 2.3 cc.

Manufactured by Atlantic Manufacturing Corp., Brooklyn, N. Y.

Admission of an article to the list of Accepted Dental Remedies does not imply a recommendation. Information regarding the rules and work of the Council will be sent on request.

HAROLD L. HANSEN, *Secretary.*

ABSTRACTS OF NOTICES OF JUDGMENT UNDER THE FEDERAL FOOD, DRUG AND COSMETIC ACT

SALE of the drugs here listed was deemed actionable because of their potential danger when used according to directions and / or because of their failure to bear adquate directions or warning statements. For each of the products in the accompanying table, judgment of condemnation was entered and the product was ordered destroyed.

N.J. No.	Name	Manufacturer	Composition
141	Bromo-Citra	Drexel Co., Elgin, Ill.	Acetanilid, sodium bromide, caffeine, sodium chloride, sodium bicarbonate and citric and tartaric acids
142	Koenig's Nervine	Koenig Med. Co., Chicago, Ill.	Sodium, potassium and ammonium bromides, extracts of plant material (including valerian), glycerin, alcohol and benzoic acid
143	Capsules Ka-No-Mor	A. G. Luebert, P. D., Coatesville, Pa.	Acetanilid, caffeine and aspirin
144	Renton's Hydrocin Tablets	Pasadena Products, Inc., Pasadena, Calif.	Cinchophen
145	Neuroine	Link Chemical Co., Emporia, Kan.	Sodium bromide and alcohol
146	Migro Headache Powder	C. J. Czarnecki, Detroit, Mich.	Acetanilid, sodium bicarbonate, tartaric acid and milk sugar
147	Nervease Headache Powders	Nervease Co., Boston, Mass.	Acetanilid and caffeine

Issued April, 1941.

ABSTRACT OF FEDERAL TRADE COMMISSION STIPULATION ON CHELF'S C. C. COMP'D.

CHELF Chemical Co., 118 South Seventeenth St., Richmond Va., stipulated with the Federal Trade Commission that it will cease certain representations in the sale of its preparation known as "Chelf's C. C. Comp'd." and also as "C.C.C.C." and "4 C's," containing, among other ingredients, potassium bromide and acetanilid. (Stipulation No. 02787.)

NATIONAL HEALTH PROGRAM COMMITTEE

THE Dental Research Bill S. 194 was reported favorably by the Senate Committee on Education and Labor May 20. It was passed by the Senate May 23. It now goes to the House of Representatives for action and will first be considered by the Committee on Interstate and Foreign Commerce.

The following is the report made by the Senate Committee on Education and Labor to accompany the Research Bill.

77TH CONGRESS, 1st Session | SENATE | REPORT No. 334

RESEARCH BY PUBLIC HEALTH SERVICE RELATING TO DENTAL DISEASES

MAY 20 (legislative day, MAY 19), 1941.
Ordered to be printed

Mr. MURRAY, from the Committee on Education and Labor, submitted the following

REPORT

[To accompany S. 194]

THE Committee on Education and Labor, to whom was referred the bill (S. 194) to authorize research by the Public Health Service relating to the cause, diagnosis, and treatment of dental diseases, having considered the same, report thereon with an amendment and recommend that the bill, as amended, do pass.

The amendment is as follows: Page 2, lines 5, 6, 7, and 8 strike out the words "to carry out the purposes of this Act, the sum of $75,000 for the fiscal year ending June 30, 1942, and for the five succeeding fiscal years such sum shall be increased $10,000 each year" and insert in lieu thereof, "such sums as may be necessary to carry out the purposes of this Act."

PURPOSE OF THE BILL

This bill proposes to authorize the Surgeon General of the Public Health Service to conduct and direct researches, investigations, experiments, and studies relating to the cause, diagnosis, and treatment of dental diseases, to assist and foster similar research activities by other agencies, private and public, and to provide the United States Public Health Service with the necessary funds for carrying out the purposes of this bill.

The bill authorizes an annual appropriation in such amount as may be necessary for the purpose of this act.

PREVALENCE OF DENTAL DISEASES

Dental caries (decay) and the periodontal diseases (pyorrhea) are the two major dental diseases. Only a very small percentage of the population escape the ravages of either or both of these diseases. A study conducted a few years ago by the American Dental Association in collaboration with the United States Public Health Service on over 1,400,000 school children in 26 States showed that more than 90 percent had one or more decayed teeth. Numerous other dental studies show that the problem of dental caries is of the same order. Owing to the fact that the tooth structure lacks the ability to repair itself as do practically all other tissues of the body, these defects accumulate at an alarming rate with increase in age of the individual.

The Nation-wide dental survey of 1,400,000 school children shows that there is an increase of 33 percent in the amount of dental decay of the permanent teeth when the 12- to 14-year-old groups are compared with the 6- to 8-year-old groups. The figures have been corroborated by a smaller detailed study made by the Public Health Service in a representative American city of about 30,000 population. This rapid accumulation of dental defects, with which the dental profession has been unable to cope, accounts for the fact that a large

majority of the adult population of this country have one or more missing teeth.

No more stirring reflection of this dental neglect could be given than that embodied in the recent reports released by the National Headquarters of the Selective Service System and the office of the Surgeon General of the Army. These reports have pointed out the tremendous magnitude of the dental-disease problem. The Nation is now confronted with the results of the general *laissez faire* policy in respect to dental research.

Currently, about 40 percent of all men examined by the Selective Service local boards are being rejected for general military service. Of the selectees examined both by the local boards and the induction stations, defective teeth constitute the highest percentage of rejections due to any single defect. Slightly over 20 percent of those rejected for general military service are rejected because of defective teeth alone. Such distressing conditions point out all too dramatically the tremendous import of the dental-disease problem.

During the last World War dental rejections amounted to 1.8 percent of the total of all men examined whether or not rejected. Under the present Selective Service Act of 1940, defective or deficient teeth, based upon these same standards, have resulted in 8.3 percent rejections of all examined. The appalling increase in the loss of military power serves to stress the point that it is essential to national health and preservation of democracy that sporadic research inadequately financed and conducted outside the ranks of national organization cannot be relied upon to meet the complexities of a problem of this proven magnitude.

Dental caries (decay) begins in early childhood and usually continues until most teeth have been affected. Despite the universal incidence of dental caries and its deleterious effects, the causes of dental caries have not been completely established and its general prevention has not been attained. Dental caries is an example of a disease with an unusually high attack rate and for which no adequate control measures have been developed. As a result, the 62,000 dentists of the United States have been unable to cope with this problem on the basis of present knowledge of the disease.

In the opinion of dental authorities, studies relating to cause and prevention of tooth decay are most important since the initial causes of many other serious diseases may follow in the wake of unchecked dental decay.

PYORRHEA

It is common knowledge that one of the important dental diseases of adult life is pyorrhea. The cause or causes of this disease, as in dental decay, are also wrapped in obscurity. Many who are fortunate enough to save a large number of their teeth by careful attention and adequate treatment lose them later in adult life as the result of the other major disease, pyorrhea, which attacks the supporting structure of the teeth.

The high incidence of this disease in the adult population warrants careful and continuous investigations, second only to decay of the teeth.

Consideration also should be given to other dental diseases of less importance than tooth decay and pyorrhea, commensurate with their prevalence and severity.

THE NEED FOR COORDINATED DENTAL RESEARCH

The need for coordinated research in dental diseases by the Government is obvious. The loss of manpower to the Nation due to dental diseases during the World War was recognized and resulted in the creation and subsequent enlargement of the dental branches of the Army, Navy, and the Public Health Service. The cost of dental services to veterans since the World War has been

no small item. A conservative estimate indicates that the American people are spending $300,000,000 per year for dental services, exclusive of dentifrices and mouthwashes. Even with this gigantic sum, only about 25 percent of the public are having their dental needs cared for. The small proportion of the public receiving adequate treatment has thus created a vast health problem in the manpower called upon to serve in industry and the military services. The infinitesimal fraction of the above amount now being spent by private agencies for dental research directed toward a reduction in the amount of dental needs attests all too well to the reasons for the present dilemma.

Any effort to meet the dental needs of the population can be no more than a temporary expedient if the program does not have an organized system of research, the sole object of which is to reduce the prevalence or eliminate the disease. A reasonable proportion of the money spent for the alleviation of dental conditions or dental public health should be employed for discovering the cause and means of prevention of the disease, whose ravages an attempt is being made to combat.

For a number of years and with limited funds and personnel, the Public Health Service has been conducting studies in certain aspects of dental disease. From these studies in diseases of both the teeth and gums, valuable information warranting the most searching inquiry has resulted. The work of the Public Health Service in this field has received wide recognition by all research groups. It seems imperative to expand these studies with additional funds and personnel in accordance with the provisions of this bill.

SUMMARY

It is proper that the Federal Government should take the initiative in this work and utilize the splendid facilities and trained investigators of the Public Health Service already operating in the National Institute of Health. They are also in a position to stimulate with small grants-in-aid those public and private institutions which are making worthwhile scientific investigations in this field. These diseases are so universal among our citizens that immediate and searching inquiry, well organized and coordinated by the Federal Government is imperative.

Any attack on the dental-disease problem must be a long-range program since such a long-range program is the very heart of the structure upon which our future methods of the control of these diseases must rest.

A reasonable appropriation made annually on a continuing basis will do much to direct a concentrated attack on a very serious problem affecting the health and security of our Nation.

BUREAU OF PUBLIC RELATIONS

THE DEVELOPMENT OF THE HUMAN DENTITION

By ISAAC SCHOUR, D.D.S., Ph.D., and M. MASSLER, D.D.S., M.S., Chicago, Ill.

INTRODUCTION

A BRIEF review of what is known of the development of the human dentition and its chronology is indicated since such facts are useful to everyday dental practice.* The development of the teeth will be traced chronologically according to the successive developmental periods that characterize the growing individual, so that the development of the dentition and the individual as a whole can be correlated.

PRENATAL PERIOD

During the prenatal period, the crowns of the deciduous teeth grow and calcify within the jaws. The formation and calcification of enamel and dentin begin first in the central incisors, at about 4½ to 5 months *in utero*, and proceed in fairly regular sequence in the adjacent teeth, the second deciduous molar beginning its formation at about 6 months *in utero*. (Fig. 1.)

Layers of enamel and dentin are deposited one upon another as shown in Figures 2 and 3, until the crown is completed and root formation begins.

The enamel and dentin formed during the prenatal period are of good quality, probably because of the favorable environment and nutrition of the developing fetus.

From the Department of Histology, University of Illinois College of Dentistry.

*The American Dental Association gave special attention to this problem when it arranged a dental health lecture for ready access to the dental profession, entitled "Nature—Builder of Teeth," available in film or stereopticon form.

BIRTH (NEONATAL PERIOD)

At the time of birth, root formation has not yet started and the deciduous teeth are not yet erupted. Within the jaws, however, the crowns of the deciduous incisors are about five-sixths completed; the deciduous cuspid crowns are about half completed, and the cusps of the first deciduous molars are just completed and have coalesced, but the cusps of the deciduous second molars are only half formed and are still isolated.

The mesiobuccal cusp of the first permanent molar begins its formation at about the time of birth, but this is not often visible in the x-ray film because its calcification is still incipient. Chronologically and in its position in the arch, the first permanent molar is the last of the deciduous teeth. Functionally, however, it is a permanent tooth, and probably the most important one for the normal occlusion of the permanent denture. It is unfortunate that parents have mistaken this tooth for a deciduous one because of its position, its early formation and eruption, and have allowed decay to cause its loss, expecting its replacement by a successor.

The birth experience, with its concomitant trauma and neonatal adjustments to the new environment and mode of nutrition, produces a distinctly accentuated incremental ring within the enamel (band of Retzius) and dentin (Owen's line of contour) of these teeth, indicating the level of calcification at the time of birth. (Fig. 1.) These are called the neonatal rings and they are found in the deciduous teeth of all children.

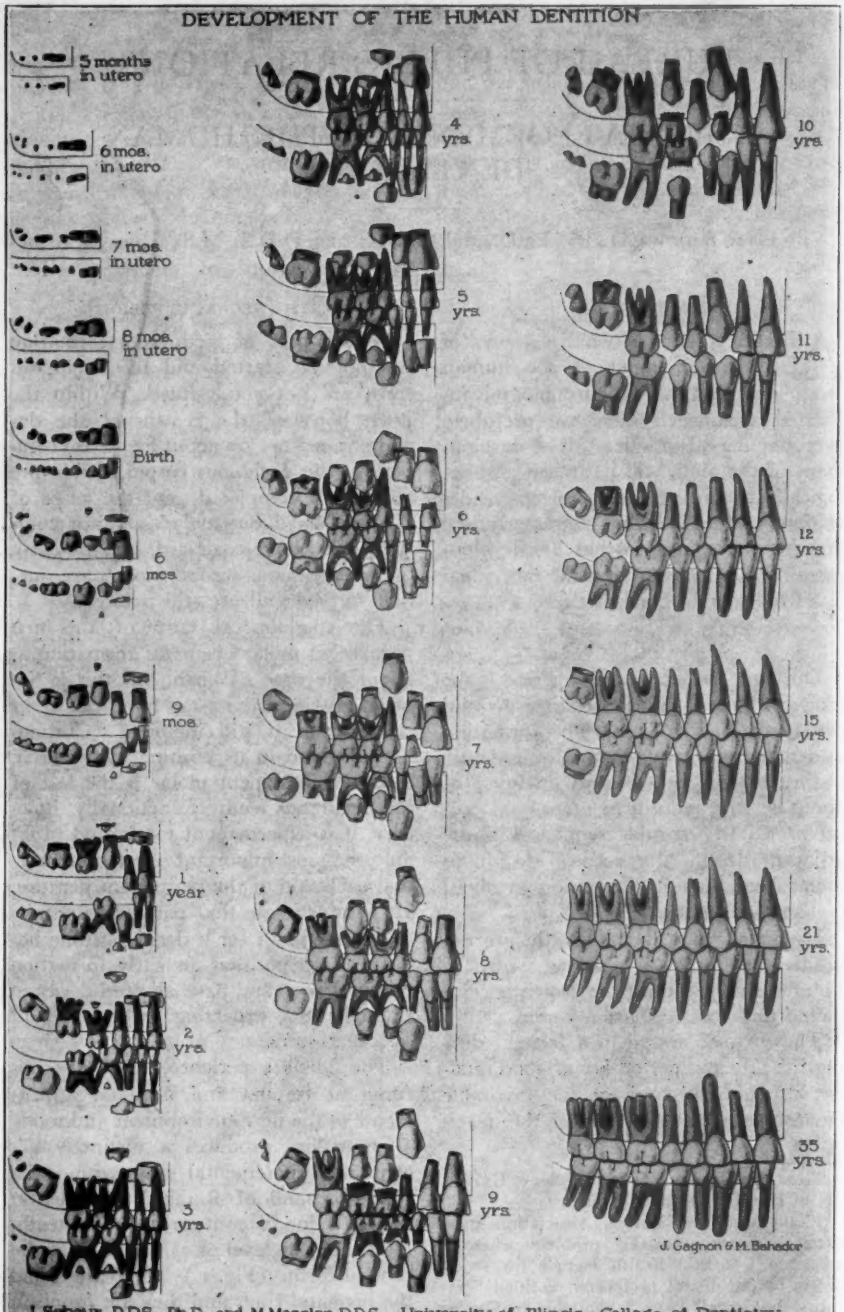


Fig. 1.—Chart showing development of human dentition. (Available in 3 colors; 12 x 18 inches in size. Suitable for framing. 15 cents each. Bureau of Public Relations, American Dental Association.)

If the birth trauma has been excessive or the neonatal adjustment very difficult, an accentuation of the neonatal ring will occur in the form of an acute neonatal hypoplastic defect, which can be seen after the teeth have erupted.

INFANCY PERIOD

The early infancy period (birth to 6 months of age) is characterized by the beginning of growth and calcification of the permanent first molars and all the anterior teeth with the exception of the upper lateral incisors. (Fig. 1.)

The first permanent molar is the first of the permanent teeth to develop. It begins to form and calcify at birth. The permanent anterior teeth begin their formation at from 4 to 6 months of age in regular order from central incisor to cuspid. The upper lateral incisor, the exception to the rule, begins to form at 10 to 11 months of age. (Fig. 1.) Hypoplasia due to metabolic disturbances occurring during the early infancy period, therefore, misses the upper lateral incisor. This fact is useful in establishing clinically the chronologic incidence of enamel hypoplasia. (Figs. 4 and 5.)

The first year of life is a period of postnatal adjustment for the developing infant and, in many respects, is a continuation of the neonatal (new-born) adjustment period. Difficulties in accommodation of the gastro-intestinal tract to the new form of nourishment results in the difficulties of feeding and in the nutritional upsets of infancy. The metabolic disturbances that result may cause hypoplastic defects in the enamel

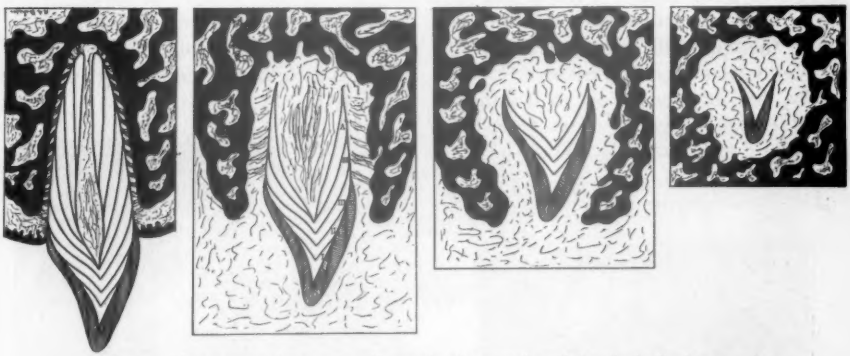


Fig. 2.—Incremental pattern of growth of enamel and dentin in incisor tooth.

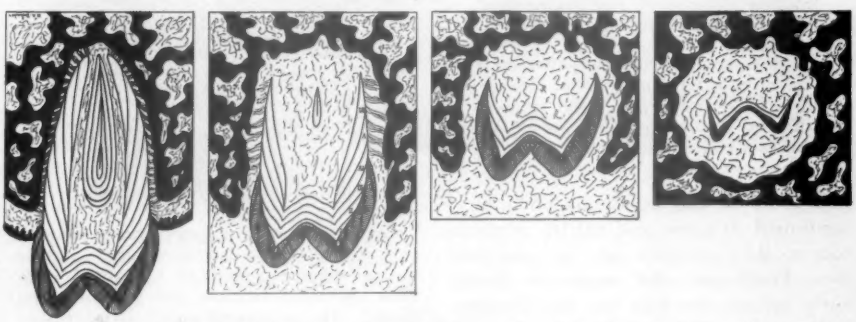


Fig. 3.—Incremental pattern of growth of enamel and dentin in molar tooth.

of the teeth forming at that time—that is, the first permanent molars and the permanent anterior teeth—but may miss the upper lateral incisors because the latter begin formation at the end of the infancy period. About three-fourths of the total number of cases of enamel hypoplasia develop during this period. The defects can be seen clinically only after the permanent teeth erupt (after the sixth year), or before that time in intra-oral x-ray films. (Figs. 4 and 5.) No amount of dietary regulation or calcium therapy will ever correct these enamel defects once they occur.

The late infancy period (6 months to about 1 year of age) is characterized by the eruption of the deciduous incisors into the oral cavity.

During the previous period, the crowns

Fig. 4.—Enamel hypoplasia affecting that portion of anterior teeth formed during infancy period. The upper lateral incisors are not affected. About three-fourths of all enamel hypoplasia occurs during infancy.

and roots of the deciduous teeth have continued to grow and calcify preparatory to their eruption into the oral cavity. Teeth are not necessary during early infancy because the diet is essentially milk. This period, therefore, is often called the period of lactation. However, supplementary feedings usually begin during the second half of the first year of life. At the same time, the deciduous teeth begin to appear in the oral cavity as if in response to a need.

The deciduous central incisors usually appear in the oral cavity at about the seventh month, the lower before the upper, and are soon followed by the lateral incisors. The first deciduous molars appear next, toward the end of the first year. Usually, as in the permanent dentition, the cuspids erupt after the first premolar tooth and are guided into position by the adjacent teeth already present.

A simple method of remembering the time and order of eruption of the deciduous teeth is shown in Table 1.

CHILDHOOD PERIOD

The preschool age, between the second and the sixth year of life, is usually called the childhood period. It is characterized by:

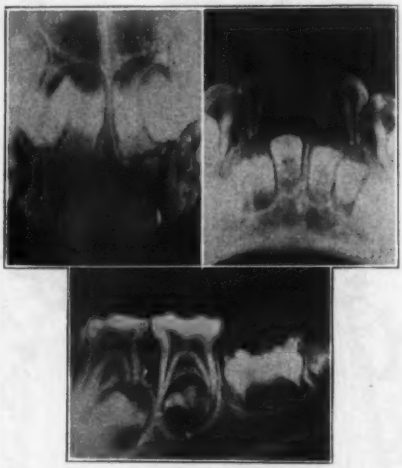


Fig. 5.—Intra-oral roentgenograms showing chronic hypoplastic defects of enamel formed during infancy period in unerupted teeth (first permanent molars and permanent incisors). The permanent upper lateral incisors are not affected. The hypoplastic defects in the deciduous teeth are not visible in the roentgenogram, but can be seen clinically in the molars. (Courtesy of B. G. Sarnat.)

1. The presence of the complete deciduous dentition within the oral cavity.
2. The functional attrition or physiologic wear of these deciduous teeth.
3. The gradual resorption of the roots of the deciduous teeth.

4. The continued growth and calcification of the crowns and roots of the permanent first molar and anterior teeth.

TABLE 1.—TIME AND ORDER OF ERUPTION OF DECIDUOUS TEETH

Upper teeth	I	II		IV	III	V
Lower teeth	a	b		d	c	e
Months	6–8	8–10	10–12	12–16	16–20	20-24

At the beginning of the second year, also, the permanent bicuspids and second molars begin to grow and calcify.

In the meantime, the permanent anterior teeth are developing, and with their development the jaw is growing. As a result, and to accommodate the larger, permanent successors, the deciduous anterior teeth usually become spaced at the fourth or fifth year (physiologic spacing of the deciduous anterior teeth). (Fig. 7.)

Concomitantly with the growth and intra-osseous eruption of the permanent teeth, the roots of the deciduous teeth become resorbed.

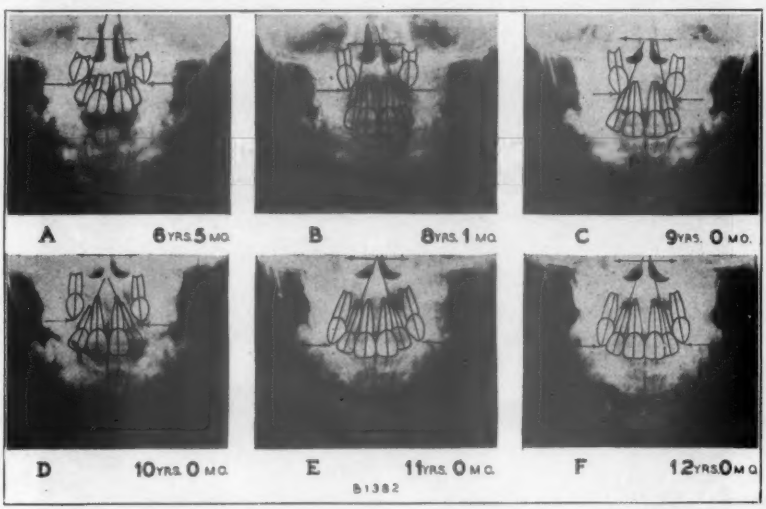


Fig. 6.—Frontal roentgenograms at 6½, 8, 9, 10, 11 and 12 years in case shown in Figure 5; indicating change in inclination of all incisors and cuspids, and path of eruption. D, "Ugly Duckling" stage. (Broadbent, B. H.: Face of Normal Child. Angle Orthodontist, 7:183-209, October 1937.)

5. The beginning of the growth and calcification of the crowns of the permanent bicuspids and second molars. (Fig. 5.)

By the end of the second year, all the deciduous teeth have erupted and are in functional occlusion. Continued function plus a more solid diet produces a functional wearing or attrition of these teeth.

EARLY GRADE-SCHOOL PERIOD

The grade-school period, from 6 to 12 years of age, is characterized by the resorption and shedding of the deciduous teeth and the eruption of the permanent dentition. It is therefore often called the period of mixed dentition.

The grade-school period is divisible into two parts: the early grade-school period, from 6 to 10 years of age, and

the prepuberal period, from 10 to 12 years of age.

The early grade-school period begins with the eruption of the first permanent molar, at the sixth year of age. It is soon followed by the appearance of the incisors, at from 7 to 8 years of age. Usually, the teeth appear in the oral cavity earlier in the female than in the male. Characteristically also, the lower teeth precede the upper in eruption. (Fig. 7.)

The incisors do not usually appear in the oral cavity in alinement. The teeth are often staggered so that the lateral incisors lie lingually from the central incisors and the upper central incisors are often spaced (physiologic spacing of permanent upper incisor teeth). (Figs. 6 and 7.) However, with the continued growth of the jaws, and under the action

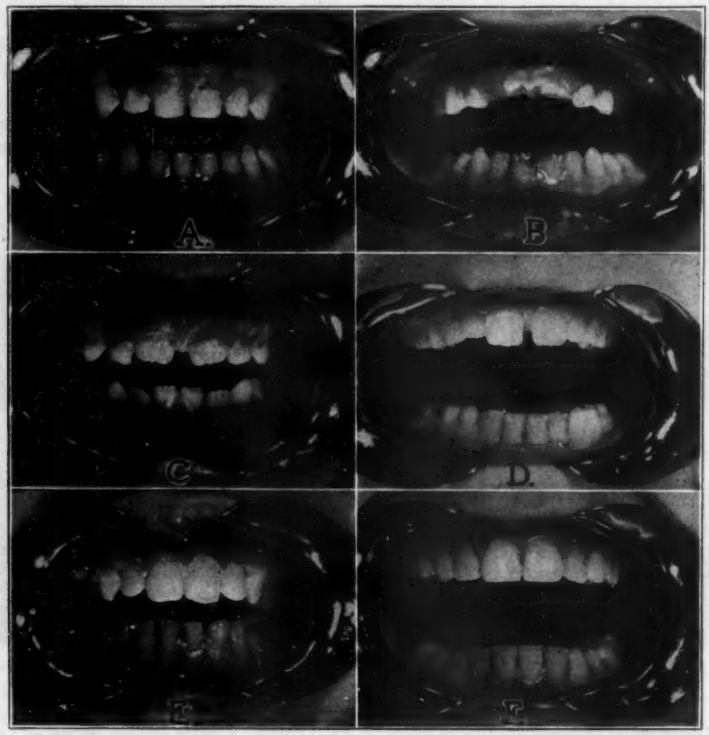


Fig. 7.—Intra-oral photographs showing normal transition from deciduous to permanent dentition in anterior part of mouth. A, at about 4½ years, showing spacing of anterior deciduous teeth. B, at about 6½ years, showing loss of upper deciduous central incisors and eruption of lower permanent central incisors. C, at about 7 years; eruption of permanent lower lateral and upper central incisors, showing spacing and inclination of upper central incisors. D, at about 8 years; eruption of permanent upper lateral incisor and beginning of closure of central diastema. The lower incisors are alined by the action of the tongue and labial musculature. E, at about 10 years; further eruption of upper lateral incisors and closing of central diastema. F, at about 11½ years; eruption of permanent cuspids, showing correction in inclination of incisor teeth. The ages given are average and may vary considerably under different local as well as systemic conditions. Girls are generally ahead of boys in tooth eruption. Closure of the central diastema may not occur until the eruption of the cuspid.

of the tongue and the labial musculature, the teeth tend to become alined. With the eruption of the cuspids, the spacing of the central incisors tends to become corrected. (Fig. 7.) This transitional stage of the dentition has been aptly termed by Broadbent the "Ugly Duckling Stage."

Malocclusion in the anterior segment of the arch often has its beginning at this time. For example, a scissored bite in which one or both of the upper incisors are trapped lingually from the lower incisors has its inception at this age. Correction is simple at this time, but more difficult at later age periods. In a similar manner, abnormal spacing of the anterior teeth, lingual version of the lateral incisors and other malpositions arise at this age.

PREPUBERAL PERIOD

There is a pause of about 1 to 2 years before the appearance of the next tooth and the beginning of the prepuberal period, at 10 years of age, marking a lag in the eruption of the cuspid tooth similar to the one seen in the deciduous dentition. The first bicuspid, like the first deciduous molar, usually precedes the cuspid.

The first bicuspids usually erupt at 10 years of age. They are followed by the second bicuspids and the cuspids, at 11 to 12 years. (Fig. 1.) The eruption of the cuspid between the lateral incisor and the first bicuspid forces the incisor teeth into correct alinement and axial inclination, and thus closes the space between the central incisor. (Figs. 6 and 7.) The first bicuspid thus acts as a buttress for the erupting cuspid. The order of eruption is therefore far more important than the chronologic age of the child. The actual age at eruption of any of the teeth is quite variable, depending upon race, sex, type and systemic as well as local conditions.

If, for any reason, such as premature loss of the deciduous cuspid or the prolonged retention of the deciduous cuspid, the space between the first bicuspid and the lateral incisor is insufficient to accommodate it, the cuspid will be forced into a position labially from the arch.

The eruption of the second bicuspid is soon followed by the eruption of the permanent second molar, at 12 years of age.

The prepuberal period is thus characterized by completion of the permanent dentition (except for the third molar) and the transition from the Ugly Duckling to a mature stage of dentition. This is correlative with maturation of the child as a whole. During the prepuberal period, the child tends to lose the roundness of childhood and advances noticeably toward adolescence.

It should be noted that eruption of the first permanent molar, at the sixth year, marks the beginning of the mixed dentitional period, and eruption of the second permanent molar, at the twelfth year, marks the end of this period. It is well to remember that the appearance of the first permanent molar begins and appearance of the second permanent molar ends the mixed dentition period. The appearance of the other permanent teeth occurs in fairly regular sequence and at yearly intervals except for the cuspid. The central incisors appear at about 7 years, the lateral incisors at about 8 years. But there then follows a pause of about one year, and the next tooth to erupt is the first bicuspid, at 10 years. The cuspid and second bicuspid then erupt, at about 11 to 12 years, and the period is terminated by the appearance of the 12-year molar. The sequence and chronology of eruption are shown in Table 2.

TABLE 2.—SEQUENCE AND CHRONOLOGY OF ERUPTION OF PERMANENT TEETH

Upper teeth	6	1	2		4	3, 5	7
Lower teeth	F	A	B		D	C, E	G
Years	6	7	8	9	10	11	12

The lower teeth tend to appear earlier than the upper teeth. In addition, it is well to remember that in females the teeth tend to erupt earlier than in males, and that race, type, nutrition and the state of health, as well as mechanical conditions, cause marked variation in the time of eruption of the teeth.

The entire mixed dentition period is a critical one and should be carefully watched as regards possible beginning of malocclusion. Since the denture is in a state of flux, premature extractions or prolonged retention of deciduous teeth, abnormal habits of the tongue and labial musculature, nail biting and other conditions may initiate widespread malocclusion. Accidents which at any other period might be considered minor have profound effects if they occur during this dynamic stage of transition from one dentition to the other.

ADULTHOOD

The permanent dentition (except for the third molar) is completed by the time the adolescent period is reached (12-15 years of age). The third molar (whose formation and eruption are quite variable) erupts into the oral cavity during the young adult period (15-21 years). At the same time, physiologic attrition of the crowns and secondary cementum formation on the roots begin, becoming quite evident by the time adulthood is reached. (Fig. 1.)

NEBRASKA HOLDS POSTGRADUATE COURSE IN CHILDREN'S DENTISTRY

THE Nebraska State Department of Health, through the Division of Maternal and Child Health, in cooperation with the Nebraska State Dental Association and its affiliated groups, held six postgraduate courses in children's dentistry in late April and early May.

The locations of the meeting places were carefully selected in order to make it as convenient as possible for the dentists.

Charles A. Sweet, of Oakland, Calif., dean of Children's Dentistry, conducted the courses, and his practical presentation was greatly appreciated by those in attendance. The afternoon and evening programs were as follows:

PROGRAM

Afternoon Session

2:00	Announcements and introduction
2:30-3:30	A. Child Management B. Office Management
3:30-4:30	A. Treatment of Fractured Anterior Teeth
4:30-5:30	A. Treatment of Non-Vital Deciduous Teeth
6:00	Dinner

Evening Session

7:30	A. Treatment of Deciduous Teeth with Exposed Pulps
	B. Cavity Preparation for Deciduous Teeth
	C. Sterilization of the Cavity and Filling Material

SELECTIVE SERVICE SYSTEM

PLAN FOR PREHABILITATION OF REGISTRANTS*

IN a nation-wide program of prehabilitation for Selective Service registrants, intended to better the health of young men registered for possible military training and the general public as well, National Headquarters of the Selective Service System urges cooperation of the dental profession to insure success of the plan.

Created with the aid of the Dental Advisory Committee to Selective Service, the prehabilitation program suggests that registrants, prior to physical examination by Selective Service local board physicians and dentists, acquaint themselves with physical standards fixed for men in the armed forces. They are asked to consult their personal dentist or physician to determine whether they conform to these standards, and have any existing remediable defects corrected by their personal dental or medical advisor.

As two out of every five men rejected as unfit for military service fail in their tests because of dental defects, National Headquarters points out that the correction of such defects, wherever possible, would materially increase the manpower supply for the military service. Consequently it asks not only the registrants to learn the physical standards required by the armed forces but requests members of the dental profession also to become thoroughly acquainted with these requirements. Dentists, consulted by registrants, would then be better suited to advise the young men concerning the possibility of correcting existing defects and bringing them up to military standards, it is pointed out.

To guide those interested, that all may benefit, National Headquarters of Selective Service has prepared advice to registrants, as follows:

PREHABILITATION OF REGISTRANTS

IV. DENTAL REQUIREMENTS AND ADVICE

Selective Service with the aid of its Dental Advisory Committee offers here advice whereby registrants themselves may insure their own dental fitness.

The Prehabilitation Plan of Selective Service aims to permit registrants to fit themselves for military examination and service by making them familiar with the standards required and through advice as to what service may be necessary to remedy their remediable defects. The prehabilitation plan includes the problem of dentistry as well as of medicine. This plan is applicable to dentistry as to medicine, since the same principles are concerned; in fact, it might be more widely applicable because the teeth are such frequent offenders. More registrants are rejected for poor or insufficient teeth than for any other one reason. In fact, two out of every five rejected fail because of dental defects.

DENTAL STANDARDS

While it is hoped that registrants will have normal or near normal teeth and gums, the Selective Service System has established minimum dental requirements in keeping with those of the

*This "plan for prehabilitation of registrants" under Selective Service is published so that dentists may be familiar with the advice that will be given to 16,500,000 registrants in an effort to make a higher percentage of those examined eligible for military service. The plan was prepared by officials of the Selective Service System with the aid of its Dental Advisory Council.

Army, for the guidance of the local and advisory board examiners in the selection or rejection of men. These requirements are listed below.

No one will be accepted for service who has less than three front teeth of the cutting variety above and three front teeth below. The edge of the lower teeth must meet the edges of the upper teeth or set slightly in back of them. Furthermore, no one will be accepted who does not have three upper and three lower back teeth (of the chewing variety) which oppose each other when the jaws are in normal movement. This means, then, that the registrant to be considered for government military service must have at least twelve teeth of the kind specified.

These twelve, or more, teeth must be sound. If they have good fillings or crowns and are free from infection, they will be considered satisfactory. The teeth must be clean and tight in the gums, and the gums must have a normal healthy appearance.

The government supposes that each young man having too few teeth has already had or will have a dentist construct plates or bridges to set on the gums where the crucial teeth are missing. Plates should have clasps (rings) which fit over some of the twelve teeth so that the chewing load will be taken up by both the gums and teeth and yield a satisfactory dental function.

Decayed Teeth—Care of Cavities.—If any teeth have cavities or present dark spots, the registrant should by all means see a dentist so that proper treatment may be completed. The modern dentist is a considerate individual, who will do everything in his power to protect you from pain. Dental care of today does not involve the same degree of discomfort as the old-fashioned care of yesterday.

When the registrant has teeth in excess of the minimum requirements, they should be prized most highly, kept clean always and in good order. They should be accorded the same care as would be given any other cherished possession of great value.

Useful Teeth.—On meeting people, fine, clean, well cared for teeth are among the first things noticed. Teeth add materially to personal appearance, as well as serving for eating purposes. Even artificial teeth, when set in the proper spaces and when well matched in color, add much of value to one's appearance and also to health. One of the most important things a registrant can do for himself is to see that his teeth are properly cared for. All vacancies resulting from extraction should be filled with good dental pontic bridgework or partial plates with clasps.

During examination the registrant should demonstrate to the examiner that he can move his jaws sideways and forward so that certain upper and lower teeth will meet and can thus be used for the purposes of cutting and grinding food. This is important to the registrant in many instances, particularly where the teeth are few in number.

Healthy Teeth.—The registrant should see that the teeth are put in first class condition by a dentist who can make sure that the gums are healthy and that any infection that was present has received proper and adequate treatment.

The first rule for keeping the gums healthy is a thorough brushing with a small strong toothbrush. Dirty teeth eventually lead to cavities and infected gums. Teeth and gums should be brushed after each meal, also before retiring. Probably the greatest cause for decay of teeth is the remnant of food particles left upon the teeth. If the food is allowed to decay, the teeth will decay under the food and the gums may become infected; so, to keep well and normally healthy, pay strict attention to cleanliness of your teeth.

Freak Teeth.—Teeth which have not come through the gums are said to be impacted or unerupted. Additional teeth are called supernumerary. Such teeth often cause jaw pains, neuralgia, eye trouble, severe unexplainable headaches, and other body ailments. In some instances the dentist can bring these teeth through the gums so that they may function and do actually take the place of teeth that are missing. In other instances such teeth may have to be removed. Whatever the remedy, it is wisest to do something about them if you have such teeth.

Infected Teeth.—Many times, teeth are broken off and the roots are left imbedded in the gums. These should be removed as a rule because they may be infected. Such teeth and roots may cause infections in the mouth, swellings, growths, or even tumors in the jaw, in the cheeks or in the glands that supply the saliva. Such swellings are often disfiguring and may even suggest deformities. In order to be certain about teeth, they should be examined at once and thereafter at least every year. X-rays are useful in detecting cavities, infections or growths, if they are of consequence, which otherwise may not be seen.

Crooked Teeth.—Small, underdeveloped or large overdeveloped jaws, with retruding or protruding upper teeth that fail to meet the lower front teeth on any jaw movement can be corrected so that the teeth will come together. Normally the upper front teeth should overlap one-third of the lower front teeth when the jaw is closed. Many dentists render this kind of dental service. A dentist who does not conduct a general dental practice, but who specializes in the straightening of teeth is called an orthodontist. Crooked teeth, teeth that do not meet, and deformed teeth and jaws can be corrected as a rule by the family dentist. If special skill is required, the orthodontist should be called in. While crooked teeth may be straightened in childhood, it is still possible to accomplish much in certain instances even in adult life.

Many registrants could undergo this kind of treatment to advantage.

Preventive Dentistry.—By attending to these simple dental needs, you can improve yourself, your appearance and your health. You can prepare yourself for examination and for service in the defense of your country in this unlimited emergency or improve yourself for work in civil life. In doing this, you will be practicing personal preventive dentistry. This, in turn, will redound to your own personal benefit now and in the future. If you take care of your dental defects early, that is, as soon as they are discovered, you may protect yourself from future disease of a more serious nature which will be more expensive and more difficult to treat.

Bad teeth and gums constitute a hazard which should not be tolerated, because they so frequently lead to illnesses which make the individual unfit for service of any kind, the office, farm, factory, or armed forces. You may think that you can "get by" with dental diseases and still carry on. Possibly you can for a while, but under such circumstances you may not be as fit or as efficient as you think. Certainly you are not fit enough for the armed forces or for any form of strenuous life. You will not be considered fit enough for service —even for limited service. It is questionable also whether you will retain the health necessary to work on the farm, in the office, or in industry. As the years pass many illnesses may beset you because of the presence of infected and neglected teeth which might have been avoided had these dental defects been corrected in early life. Why not face the issue squarely now, dispose of

the dental defects immediately and fit yourself for service and for better health?

DENTAL ADVICE

If you are interested in restoring and conserving your dental health you should visit a local dentist for advice and for recommendations as to treatment.

SUMMARY

If you will regard your body as your most priceless personal possession and then give it the care you would expend on any other cherished possession, you should become a strong citizen, well equipped to answer any call, civil or military. Your health and welfare is in your own hands to dispose of as you see fit.

Remember this—the health of your teeth is essential to the health of your body. The health of your body is at present of crucial consequence to the welfare of your country in its plan of National Defense.

LEWIS B. HERSHEY,
Deputy Director,
Selective Service System.

ADVISORY COMMITTEE TO SELECTIVE SERVICE

RESOLUTION

Certain facts having been brought to the attention of the Dental Advisory Committee, the Committee has passed the following resolution:

"Resolved that, when a registrant consults his dentist with the view to having several teeth removed, the removal of which may change his Selective Service classification, it is advisable for the dentist to contact the local board prior to instituting treatment, except in those cases of evident acute dental infection.

"The Committee recommends that the American Dental Association bring this to the attention of the dental profession."

C. RAYMOND WELLS,
Lt. Comdr. (DC) U.S.N.R.,
Chief Dental Officer,
Medical Division,
21st Street and C Street, N.W.,
Washington, D. C.

RESEARCH COMMISSION

THE GENERAL USE OF CEMENT IN RESTORING LOST TOOTH STRUCTURE

CEMENT of any type has not been generally considered as a so-called permanent filling material. This is the almost universal viewpoint of both educational and practicing authorities. However, within the last few years, some individuals have stated that the old time stone cements (a combination of zinc phosphate and silicate) could be indiscriminately used in extensive restorations, even when they were subjected to severe biting stress. This would include, of course, the restoration of angles in the anterior teeth and the multisurface restorations in the posterior teeth.

The Research Commission has attempted to correct some of the statements that have appeared in the advertising literature regarding the suitability of zinc phosphate silicate combination cements for restorations of the foregoing type. The rebuttal to the commission's efforts along this line have been numerous testimonials accumulated by the manufacturers to the effect that such and such a cement is, in the dentist's opinion and as a result of his experience, able to withstand, even in exposed places, severe stress.

The Research Commission invites you to advise it regarding your experiences in using such cements in these large exposed restoration areas subjected to occlusal and masticatory stresses. Please send your communications to: Daniel F. Lynch, Secretary, Research Commission, 1678 Primrose Road, N. W., Washington, D. C.

M. D. HUFF, *Chairman,*
Executive Board of the
Research Commission.

Publication of the following correspondence has been authorized by the Executive Board of the Research Commission as an indication of the difficulty that a dentist may have when he attempts to get information on some of the materials he may be using.

M. D. HUFF, *Chairman,*
Research Commission.

COPY

February 25, 1941

Perma Vita Dentures
Ogden Park Station
Chicago, Illinois
Gentlemen:

The advertising brochure which you distributed at the meeting of the Chicago Dental Society has been brought to our attention. Among the many claims that you make for the material is one that it is protected by United States and foreign patents. May we have the numbers of these patents to which you refer?

It is also stated that the material possesses exceptional tensile strength and flexibility. May we have data on these two properties as determined by your laboratory also.

Is Perma Vita a strong methyl methacrylate resin or a mixture or co-polymer of the various acrylic resins? If the latter, what resins are used to compound it?

We have received several requests for information about this material and ask your assistance in the matter.

Sincerely yours,
DANIEL F. LYNCH,
Secretary.

COPY

March 21, 1941

Perma Vita Dentures
Ogden Park Station
Chicago, Illinois
Gentlemen:

It has been almost a month since we wrote you concerning the advertising brochure that you distributed at the Chicago Dental Society meeting last month. Would you please answer our questions as given in that letter of February 25? Sincerely yours,

DANIEL F. LYNCH,
Secretary.

COPY

PERMA VITA DENTURES
6718 South Justine Street
Chicago, Illinois

March 26, 1941

Mr. Daniel F. Lynch, Secretary,
American Dental Association,
1678 Primrose Road, N. W.,
Washington, D. C.

Dear Sir:

We do not have your letter of February 25th. If you will send us a copy of it, we will answer as many of the questions as is prudent at this time.

We are enclosing another copy of the brochure you refer to, together with a copy of the processing technique sheet, which is included with every unit of material shipped out.

May we hear from you in the near future since we wish to cooperate with you as best we can to help relieve the Dentists of a prolonged "headache,"—tinfoiling.

Sincerely,
A. S. WHITE
Perma Vita Dentures.

COPY

April 1, 1941

Perma Vita Dentures
6718 South Justine Street
Chicago, Illinois

Gentlemen:

Enclosed is a copy of my letter of February 25. We will appreciate a prompt reply.

Thanking you in advance, I am

Sincerely yours,
DANIEL F. LYNCH,
Secretary.

COPY

(Sent by Registered Mail)

April 23, 1941

Perma Vita Dentures
Ogden Park Station
Chicago, Illinois

Gentlemen:

Here is the history of our correspondence with you regarding your claims for Perma Vita Dentures. On February 25, 1941, we wrote you asking questions about certain advertising statements in the pamphlet that you distributed at the meeting of the Chicago Dental Society. Having no word from you, we again wrote you on March 21, approximately a month later. You replied to this letter on March 26, stating that you had not received our letter of February 25, so on April 1, we sent you a copy of our letter of February 25.

So far we have received no reply from you. We are, therefore, sending you again a copy of our letter of February 25, and hope that you can reply to this by return mail.

Sincerely yours,
DANIEL F. LYNCH,
Secretary.

LIST OF CERTIFIED ACRYLIC DENTURE RESINS

ON PAGE 325 of the February 1941 issue of THE JOURNAL, the Research Commission published a specification for acrylic resin. In the foreword to this specification, it was stated that the commission would consider certifications of manufacturers immediately so that a list of resins which comply with the specification could be published, without delay. So far, only the materials listed below have been certified by the manufacturer or distributor, tested at the National Bureau of Standards and found to comply with the specification requirements.

Several other materials are in the process of certification and additions will probably be made to the list at an early date. THE JOURNAL will carry these additions.

Material	Form	Certified by
Densene	Powder/liquid (pink)	Cosmos Dental Products, Inc.
Lucitone	Powder/liquid (pink)	The L. D. Caulk Co.
Lucitone	Powder/liquid (clear)	The L. D. Caulk Co.
Lucitone	Plastic cake (pink)	The L. D. Caulk Co.

THE REGISTRY OF DENTAL AND ORAL PATHOLOGY OF THE AMERICAN DENTAL ASSOCIATION

REPORT OF THE COMMITTEE ON NATIONAL MUSEUM AND DENTAL REGISTRY

NEW PROGRAM OF STATE BOARD EXAMINATIONS IN DENTAL PATHOLOGY

THE Registry of Dental and Oral Pathology, with the aid of the National Association of Dental Examiners and several of the state boards, recently instituted a program whereby a practical examination in dental pathology may be included in the state board requirements. This plan, although new and somewhat revolutionary, has met with unusual success and is rapidly being accepted by many of the state examining boards.

Much of the progress made in this undertaking is due to the cooperation of the Iowa State Board of Dental Examiners and the District of Columbia Board of Examiners. Both are now using this type of examination and report excellent results. Recognition of the value of stressing dental pathology in examining the applicant for license is, in itself, an indication of a definite understanding of the problems incident to the better practice of dentistry. The leadership shown by these two organizations is to be commended, and it is hoped that all of the remaining state boards will soon adopt this type of examination.

The examination, although essentially practical, may be presented in a variety of ways. It has been given as an entirely practical identification of labeled photomicrographs and also as an essay type of examination. These two methods may be combined and thus other acceptable methods be evolved. The material is furnished by the Registry of Dental and Oral Pathology at the Army Medical Museum, Washington, D. C. The charge is nominal, being sufficient to cover only the cost of the material and its preparation. The photomicrographs are backed with linen to avoid tearing and mounted in a loose-leaf cover labeled for the individual state board. (Fig. 1.) The book may contain as many or as few photomicrographs as desired. The standard book now being used contains eleven pages, covering, in some detail, the pathology of the dental structures. Appropriate examination questions will be furnished by the registry if desired. A detailed list of the subject matter covered by available photomicrographs is now being compiled and will be available shortly.

Under this plan, it will be possible for the average state board to accumulate sufficient material to examine their applicants at a very slight cost. This material, rearranged from year to year, will provide more than ample possibilities for examination. Additional pages (photomicrographs), because they are available at a cost of a few cents, may be substituted when desired.

The purpose of the registry in providing this service is to emphasize the importance of dental pathology and the other basic sciences to the practicing dentist. It is believed that such stimulation will result in the development of a scientifically operating dentist. This entire program is to be presented before the National Association of Dental Examiners at the annual meeting in Houston, Texas. It is our purpose, however, to interest as many states as possible before that time. Requests for additional information should be addressed to the

Curator, Army Medical Museum, Washington, D. C.

LOAN SETS ON DENTAL AND ORAL PATHOLOGY

The loan sets continue to represent the most active of the registry services. In order that they may have a still wider appeal, it is planned to add several of the more interesting cases received since their completion. These sets are available to individuals, study groups and schools for a period of six weeks. In the case of the dental schools, special arrangements can be made. The deposit of $25 required is returned to the borrower when the sets have been received in good condition. The sets now contain sixty-two slides, covering the field of dental and oral pathology. Considerable material on histology is also contained in this material. Each slide is completely described in the syllabus which accompanies the slides. The case history and, in some instances, a photomicrograph are also included. (Fig. 2.)

It is the desire of the committee to emphasize the ease with which these sets can be obtained. A minimum of effort makes it possible for the individual or study group to review thoroughly the field of dental and oral pathology and in a manner that will not require detailed reference to numerous textbooks.

All requests for the loan set should be made directly to the Curator, Army Medical Museum, Washington, D. C. If a check for the required $25 deposit accompanies this request, a set will be mailed immediately.

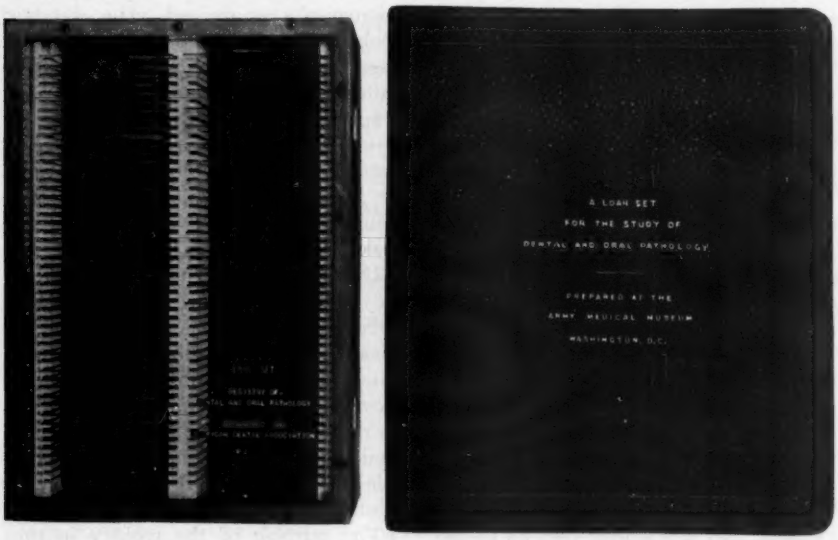


Fig. 1.—Loose leaf booklet of photomicrographs now available as state board examination material.

ATLAS OF DENTAL AND ORAL PATHOLOGY

Some copies of the atlas are still available. Additional copies will be made shortly and announcement will be made when they are completed. This book makes an ideal study reference from which to obtain valuable information

without detailed reading. Requests for the Atlas should be made directly to the American Dental Association, 212 E. Superior Street, Chicago, Ill.

EXHIBITS

Since January 1, 1941, the registry has participated in several state meetings. In each instance, much interest was shown in the various activities of the committee. Exhibits were sent to the following meetings:

Chicago Dental Society Midwinter Meeting, Chicago, Ill., February 17 to 20: Title: Loan Sets and the Atlas in the Field of Dental Pathology.

Five State Post Graduate Clinic, Washington, D. C., March 9 to 13: Title: Demonstration of the Method for Preparing Tissues for Histologic Study.

Massachusetts Dental Society, Boston, Mass., April 14 to 17: Title: Photomicrographs in Black and White and in Color, Showing Cases from the Files of the Registry of Dental and Oral Pathology.

New Jersey State Dental Society, Asbury Park, N. J., May 7 to 9: Title: Photomicrographs in Black and White and in Color Showing Cases from the Loan Sets and the Atlas. (Gross specimens from the Dental Section of the Army Medical Museum.)

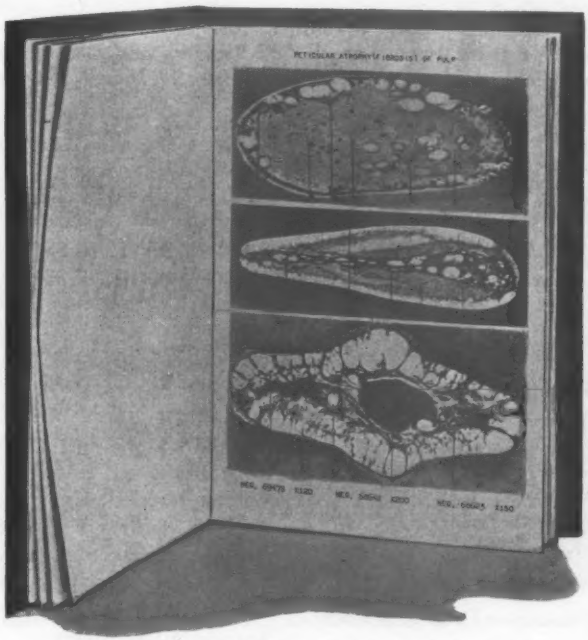


Fig. 2.—Loan set on dental and oral pathology.

MISCELLANEOUS

A number of interesting cases have been added to the files of the registry in the past several months. Many of these cases were shown at the above-listed meetings. Since the number of cases in the registry has almost doubled since the completion of the loan sets, it is planned to revise the set to include many of these new cases. The working plan has been

to keep them in loose leaf form so that additions and changes may be made when indicated.

It is desired to call attention to the biopsy service of the registry offered to all contributors. This service is offered either through the local pathologist or, when a pathologist is not available, directly to the contributor. Blanks for registering cases are available and will be sent, in any quantity, upon request directly to the museum.

One of the original purposes of the originators of the registry was to compile numerous pathologic lesions and later, from such a collection, to compile a statistical report or survey. It is obvious that such information would be invaluable, especially if such a report could be in the nature of a textbook. Since the cases in the registry number close to 3,000, it is believed that such a survey is indicated. It is the plan of the committee to institute such a procedure as soon as possible.

HENRY A. SWANSON, *Chairman,*
Committee on National Museum and Dental Registry
JOSEPH L. BERNIER,
Secretary and Pathologist to the Registry of Dental and Oral Pathology

NATIONAL BOARD OF DENTAL EXAMINERS

SUCCESSFUL CANDIDATES IN PART II SESSION OF THE NATIONAL BOARD EXAMINATIONS MAY 5 AND 6, 1941

ATLANTA-SOUTHERN DENTAL COLLEGE
I. Joseph Glazer

BALTIMORE COLLEGE OF DENTAL SURGERY
Joseph C. Dembo
Herbert E. Klingelhofer
Kenneth D. Kornreich
Max Singer

CHICAGO COLLEGE OF DENTAL SURGERY
Adolph Baranowski

KANSAS CITY-WESTERN DENTAL COLLEGE
Michael Buchman
Marcus Pollak
Isidor Nash

NORTHWESTERN UNIVERSITY
Harold Berk
Norman R. Joffe
M. R. Kennedy
William M. Michaels

TEMPLE UNIVERSITY
Walter L. Orgera
Newton E. Faulkner

TUFTS UNIVERSITY
Norman Alfred Emery

UNIVERSITY OF IOWA
Bernhart C. Hermann
Everett C. Hogan

ST. LOUIS UNIVERSITY
Frank Kovacs

THE HOUSTON MEETING

BECAUSE 1941 has brought to dentistry new responsibilities of historic import, the Eighty-Third Annual Meeting of the American Dental Association in Houston, Texas, October 27 to 31, will take its place in the annals of the profession as one of dentistry's landmarks.

Realization of the importance of the eighty-third meeting by dentists throughout the nation is evidenced by the large and early reservation response, which indicates that 8,000 members will be on hand in Houston when Wilfred H. Robinson brings down the gavel at the opening session.

At the same time, dentistry has never before been so definitely in the forefront of public attention. The Centennial Convention of last year, together with the rôle of the profession in national defense, has placed the profession squarely in the limelight.

It is at the annual meeting that the dentist has his best opportunity to gain new knowledge and inspiration. Several hours or several days spent among the Scientific and Health Exhibits will make attendance at the Houston convention worthwhile. New technics, scientific reviews, collections, public health projects and hundreds of models, charts and specimens among the exhibits, which could not so effectively be presented in essay or clinic form, will be on display.

The general sessions, the exhibits, the 400 table clinics and eight Scientific Sections will all be housed in the new $2,000,000 Sam Houston Coliseum, which provides, in addition to 175,000 square feet of exhibit space, thirty-six meeting rooms and an air-conditioned music hall which seats 2,000.

Sam Houston Coliseum and Music Hall, Houston, Texas, in Houston Civic Center.

Convention headquarters will be in the Rice Hotel, and 5,000 rooms will be provided in more than thirty modern hotels of Houston, as well as several hun-

dred multiple room apartments, available to delegates at regular year-round rates.

The largest city in Texas, Houston is ideally located for the convention. It is served by six major railroad systems, three transcontinental airlines and nine steamship companies.

Recreational opportunities in Houston are far-famed. There are ten top-flight golf courses and the nearby Gulf of Mexico provides swimming, fishing and boating. Less than 50 miles away is Galveston Island, famous for its beaches, semitropical climate and Pirate John Lafitte legends.

In addition to affording scores of historical points of interest close at hand, Houston is one of the gateways to Mexico, which the delegates have been cordially invited to visit on postconvention tours.

THE SCIENTIFIC AND HEALTH EXHIBITS OF THE AMERICAN DENTAL ASSOCIATION AT THE HOUSTON MEETING

How many times have you read of a new theory, a new technic or a new discovery and then wished that you might discuss it with the author? All of us who read the dental journals have done just that, have we not?

The American Dental Association is, of course, unable to send the men who write about new things in dentistry to call upon you. However, it has planned something that in effect and purpose is not far from that. Many leading clinicians, teachers, investigators and authors have agreed to prepare material for exhibition at the Houston Meeting. They will spend five days with their scientific and health exhibits, which will be located in the new Sam Houston Coliseum, with its 71,000 square feet of floor space, excellent lighting and ventilation facilities. There will be on display exhibits in prosthetics, oral surgery, operative dentistry, diseases of the mouth, pathology, anatomy, bacteriology, public health and education, and nearly every other phase of dental science and art will be well represented. The exhibitors will indeed be glad to discuss their subjects with you. Among these exhibitors will be the major prize winners of previous exhibits at the American Dental Association, American Medical Association and the various state and component society meetings.

Roentgenograms (wet and dry specimens), microscopic slides, transparencies, models, charts, drawings, black and white and the newer color photographs and many other media will be used to portray vividly the work of the exhibitors.

Some of these exhibits have been in preparation for several years. Study of the Scientific and Health Exhibits will be like turning the pages of a huge illustrated, up-to-the-minute textbook on the broad subject of dentistry. A motion picture section has been provided whereby you may view the latest technics developed in all branches of dentistry.

Plan to spend an hour, a morning or a day in the exhibits. Make that attractive booth a place for meeting your friends and then spend more time in this drama of dentistry.

Look for the Scientific and Health Exhibits at the new Sam Houston Coliseum. We will be looking for you in our show of "dentistry in progress."

LEO F. MARRÉ, *Chairman,*
Scientific and Health Exhibits Committee,
Missouri Theatre Building,
St. Louis, Mo.

American Dental Association

Houston, Texas October 27-31, 1941

HOTEL RESERVATIONS

To secure hotel accommodations for the 1941 Meeting, consult the rate list page 1174 and fill out the blank below. Mail this immediately to the hotel of your first choice or to the Housing Committee, Room 344, Rice Hotel, Houston, Texas. Confirmation will be sent to you by the hotel.

Second and third choices of hotel should be indicated. If the reservation cannot be made at any of the hotels of your choice, the Housing Committee will place you in as favorable a hotel as possible and will notify you.

Please remember that a reservation constitutes a contract with the hotel to provide you with the accommodations you desire. If you find it impossible to carry out your part of the contract, namely to occupy the room at the time agreed upon, please write or wire the hotel, releasing the room, in order that it may be available for other members.

APPLICATION FOR HOTEL ACCOMMODATIONS

AMERICAN DENTAL ASSOCIATION

Houston, Texas October 27-31, 1941

HOTEL.....1st choice

HOTEL.....2nd choice

HOTEL.....3rd choice

Kindly reserve the following: ☐ Single room ☐ Double room ☐ Twin beds.

.....rooms with bath for.....persons $.....per room

.....rooms without bath for.....persons $.....per room

Arriving on October.....at.....a.m.....p.m.

ROOMS TO BE OCCUPIED BY:

NAME	ADDRESS IN FULL

NOTE TO HOTEL NAMED AS FIRST CHOICE: If the hotel of first choice is unable to make reservation requested, this application should be forwarded at once to the Housing Committee, Room 344, Rice Hotel, Houston, Texas.

SCHEDULE OF RATES

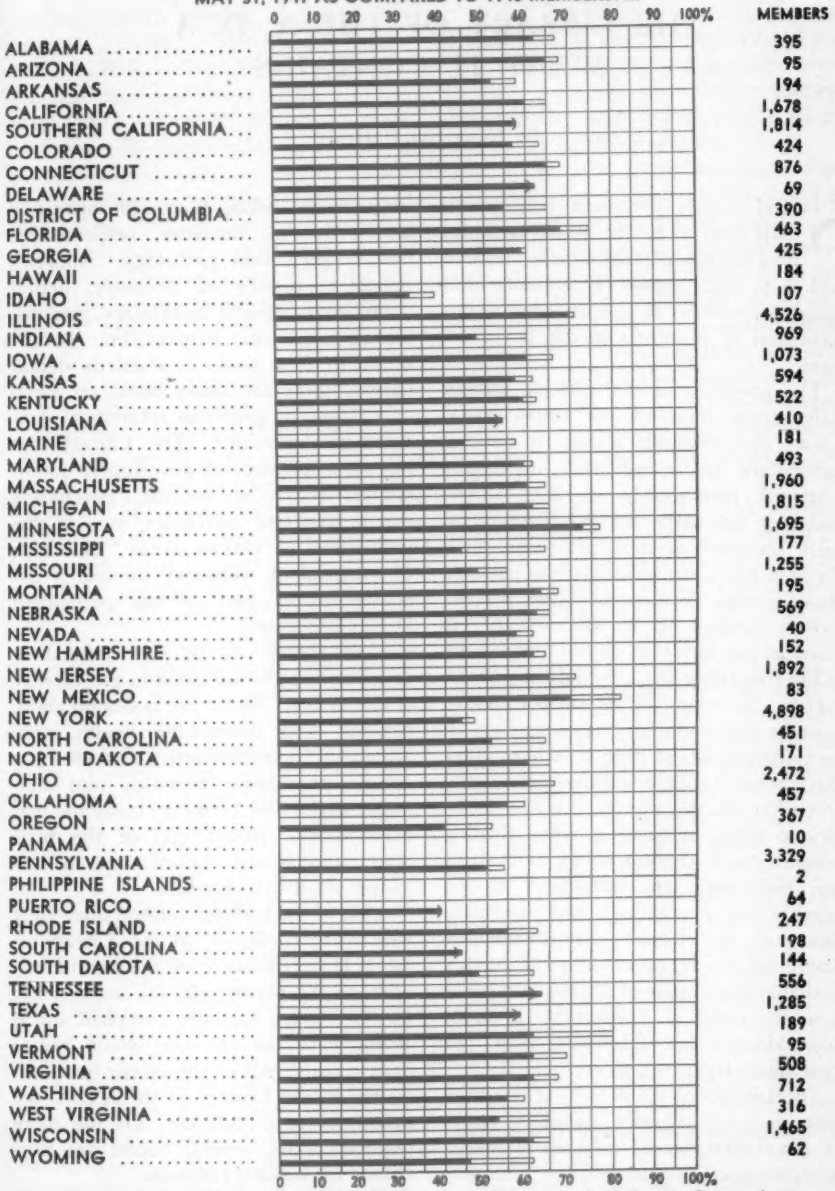
ALL ROOMS WITH BATH*

Hotels	Single	Double	Twin	Suites
AUDITORIUM, 701 Texas	$2.50–3–3.50	$3.50–4.50–5.50	$5	
BELMONT, 1308 Clay	$2	$3–3.50		
BRAZOS, 608 Preston	$2.50	$4	$4	
BRISTOL, 712 Travis	$2.50–3–3.50	$3.50–4–5	$4	
COTTON, Rusk and Fannin	$2–2.50–3	$3–3.50–4.50	$4	
DE GEORGE, 1418 Preston	$2	$3–3.50	$4.50–5.50	
FREDS HOTEL, 1006 Dallas	$1.50–2	$2–3	$2.50	
SAM HOUSTON, 1115 Prairie	$2.50–3–3.50	$4–5–6	$5–6	
HAMFORD APARTMENT, 919 Dallas	$1.50–2	$2–2.50		
HOUSTON CLUB, Commerce Building	$4–5–6	$6–7–8		
LAMAR, Main and Lamar	$3–4–5–6	$5–6–8–9	$5–7–8–9	$12–14–15–18–20–24
LAMAR ANNEX HOTEL, 916 McKinney	$2.50–3–4	$4–4.50–5–6	$5–6	
LEE, 1114 Polk	$2	$2.50–3	$3	
MACATEE, 519 Washington	$2–3–3.50	$3–4–5	$4–5	
BEN MILAM, 1521 Texas	$2.50–3–3.50	$3.50–4–4.50	$6	
MILBY, 902 Texas	$2–2.50–3	$3–3.50–4	$4–4.50–5	
OXFORD, 811 Lamar	$2	$3–4		
PARK, 610 Louisiana	$1.50	$2–2.50	$3	
WILLIAM PENN, 1423 Texas	$2–2.50–3–4	$3–3.50–4.50–5–5.50	$6	
PLAZA, 5020 Montrose	$3–3.50–4–5	$4.50–5–6–7	$6–7	$8–15
RHODES APARTMENT, 611 LaBranch	$2	$2.50–3		
RICE (Headquarters), Main and Texas	$3–4–4.50–5	$5–6–6.50–7–8	$6–7–8–9	$12–22–40
ROOSEVELT, 1111 Clay	$2	$2.50–3		
ROSSONIAN APARTMENT, 919 Fannin				$6–8
SAN JACINTO, 820 Main	$2.50–3–3.50–4	$4–4.50–5–5.50	$5.50–6–7–8	$10
STRATFORD, 414 Fannin	$2–2.50–3	$4.50–4–4.50	$4–4.50	
TENNISON, 801 Washington	$2	$3	$3.50	
TEXAS STATE, 720 Fannin	$3–4–5–6	$5–6–7–8	$6–7–8–9–10	$12–16–18–24
TRAVELERS, 114 Main	$1.50–2	$2–3		
WALEE, 1010 Caroline	$2	$2.50–3		
WARWICK, 5701 Main	$3.50–5	$3.50–5	$5–6	$6.50–7.50–9–11–18
WOODROW, 1412 Fannin	$2–2.50	$3–4–5		

*Rates on rooms without bath by request.

Membership Page

PERCENTAGE OF DUES RECEIVED IN CENTRAL OFFICE AS OF MAY 31, 1941 AS COMPARED TO 1940 MEMBERSHIP



Percentage based on dental population figures supplied by the State Society Secretaries

1941 percentage. 1940 percentage.

LIBRARY BUREAU

THE LIBRARY OF THE A. D. A.: WHAT IT CONTAINS

By JOSEPHINE P. HUNT

SUCH widely divergent conceptions exist both as to the actual material now available in the Library Bureau and as to what should be available that some clarification of the situation and a statement of resources should be of interest.

The problems of the Library Bureau differ from those of the usual dental school and research library in several particulars. In the first place, the widely scattered membership of the A.D.A. makes it necessary for the Library to carry on most of its contacts by mail. To help meet this situation, the package libraries were developed. These are described further on in this article. As many of our members do not have access to libraries other than the Library of the A.D.A., the scope of its subject matter must be broader than that contained in many dental school libraries where other departmental college libraries are readily accessible. In this library, it is not necessary to select material as when dealing primarily with student needs, as most of our borrowers are presumed to be capable of evaluating new technics, short-cuts and theories for themselves. Above all, the literature must be readily available since many of the requests come in as the result of emergencies in practice. Many other differences exist, but these illustrations will serve.

The Library of the A.D.A. at this time contains 5,100 volumes, including books for circulation, bound volumes of magazines, transactions, indexes, etc. The major portion of the books pertain to dental subjects, including books on operative and prosthetic dentistry, orthodontics, oral surgery, oral pathology, children's dentistry, history of dentistry, dental bacteriology, dental metallurgy, practice management, oral hygiene, etc. In addition to these books of a strictly dental nature, there are many books on social and economic problems relating to dentistry and medicine. The Library also has an assortment of government publications regarding income, purchasing power, types of purchases, etc., of the population of various areas. This type of material of transitory interest is not considered as part of the permanent library collection.

Many books on subjects related to dentistry are also included in the Library of the A.D.A. There are books on child, personal and community health, diet, anesthesia, materia medica and pharmacology, physiology, histology and anatomy, and a few books on medicine and bacteriology. About 500 of the textbooks and bound volumes are in languages other than English.

A list of the books published since 1933 which are contained in the Library of the A.D.A., exclusive of the bound volumes of the periodicals, the indexes and the directories, has been compiled and is available to any one who would like to have a copy. All of the recent books included in the Library of the A.D.A. are available for circulation. Of the more popular books, several copies are purchased for lending purposes.

The Library is now receiving approxi-

mately 246 journals regularly. Of these, 119 are dental periodicals in English, seventy-five are in foreign languages, including French, German, Spanish, Portugese, Finnish, Norwegian, Dutch, Swedish, Italian, Greek, Danish, Chinese, etc., and fifty-two are on allied subjects, including four public health journals, exclusive of state publications, three journals of pharmacy, one each on physical therapy, anesthesia, hygiene and metallurgy, two on biologic chemistry, about half a dozen publications on current events and social problems and the remainder on medicine and surgery; a total of 246 periodicals currently received.

There are also many worth while journals that are not now being received, including several from which articles are abstracted for THE JOURNAL. The abstracting is done outside the Central Office and the Library is not connected with it. Sometime, it may be desirable and possible for the Library to receive all of the journals from which abstracts are taken. There is not sufficient call for these publications to warrant getting them at this time, however, especially in view of the crowded condition of the Library.

Of the foreign magazines that are now being received, some of the finest are those from the South American countries, and to any one who is particularly interested, a list of all of the dental magazines now received from South America will be sent on request or copies of these publications may be borrowed if it is desired to determine their suitability for other libraries. A number of very fine books from South America are included in the book list which was previously mentioned.

The bound volumes of the periodicals are not generally circulated, but usually the articles desired can be supplied through the clipping copies, of which the Library Bureau has a vast store. Conservatively estimated, these clipping or duplicate copies of magazines which are shelved in our storeroom total upwards of 35,000. Some idea of how many magazines are stored may be gained from the fact that though 653 magazines were recently presented to another library, this reduction made no impression whatever on the storeroom supply.

In addition to these storeroom clipping copies of magazines, the Library has in filing cases, arranged according to subject, more than 42,000 reprints, clippings and pamphlets. Most of these are included in the "package libraries," which are available to the entire membership. In addition to these reprints, which are classified according to subject, there are an additional number of reprints, which are arranged alphabetically according to the name of the author.

For those who have not had occasion to use the Library service, it might be stated that a "package library" is a collection of articles and reprints on some highly specialized phase of dentistry. These packages cover about 350 phases. When there is particular interest in a subject, as for instance, at this time, in the subjects of electroplating, acrylics and of fractures, there may be a number of packages on one subject. A list of those which have been compiled will be sent to any member on request. The average package contains about thirty articles and the rental fee is 50 cents. More than 50,000 articles are circulated through the package libraries each year.

At present, the space allotted to the Library is not adequate for the Library needs. There is a shortage both of shelving and reading room which presents temporary difficulties. It is believed that, in a short time, adequate facilities for the Library will be available and that the quarters will be compatible with the Library needs.

With rare books, or so-called "collec-

tor's items," this Library is not well supplied. Though valuable because of their rarity, these "collector's items" usually contain little of a practical nature and do not add a great deal to the research resources of a library. Most books that contain valuable information are published in sufficient numbers not to be valuable from the collector's standpoint. These old or otherwise rare publications add considerably, however, to the prestige of a library, make interesting items for display purposes, and are of historical significance. For these reasons, this Library would like to further develop its resources in this respect. Dentists who have old books or magazines should remember this Library when considering the ultimate disposal of their collections. Most dental books or periodicals published prior to 1860 would be welcomed.

Your cooperation in making this Library as serviceable as possible is solicited. Any specific suggestions for enhancing its value are welcome.

COMMITTEE ON LEGISLATION

RECENT COURT DECISIONS

Dental Practice Act: Sufficiency of evidence of advertising in violation of law. The defendant dentist's license was revoked by the California Board of Dental Examiners for violation of Section 1680, Subsection 11, 14, of the Dental Practice Act. This section prohibits certain advertising practices by dentists on the ground that they constitute unprofessional conduct. The defendant maintained seven offices in seven California cities. In the window of his Sacramento office, which was in charge of an employe of the defendant, there had been a case containing a human skull and several dentures. Appended to the case was a typewritten statement "unbreakable." The defendant stated that as soon as this display was called to his attention, he had it removed. He also said that he did not know about its installation, that he knew it was illegal and that no denture is unbreakable. He appealed to the courts to force the dental board to reinstate his license.

The appellate court refused to grant his request stating that "it would not be necessary to show that he prepared or placed or even saw the advertisement if there was a consciousness or awareness on his part of the advertisement." The court mentioned the fact that there was evidence of continuing advertising for almost a year and stated that, in his numerous visits to the office, the defendant had ample opportunity to know of the sign. Furthermore, two of his employes stated that the information was conveyed to him. From all the evidence, the court concluded that the defendant's approval of the maintenance of the exhibit could be implied in spite of the fact that it was denied. The action of the board in revoking the defendant's license was thus held to be justified.—Orwitz v. Board of Dental Examiners of California, 41 Cal. App. 2d 653, 107 P. 2d 407.

THE DEDICATION OF A SHRINE TO DENTISTRY AT BAINBRIDGE, OHIO

THE crowning event of the Dental Centenary Celebration in 1940 was the dedication, November 24, of the house occupied by John Harris in the village of Bainbridge, Ohio, while he was engaged in the practice of medicine and dentistry. This building, dedicated as a shrine to dentistry, has been christened the "Cradle of Dental Education."

Here was marked the first step from the long-established preceptor-student relation to a broader education, which, in the mind of Dr. Harris, was necessary for the practice of dentistry as a branch of health service. Here, the educational requirements were such that "no student will be received who has not at least a first rate English education," in order that students might be prepared to pursue the studies in the school curriculum; and here also was discussed the necessity of a higher education for students to practice dentistry and the importance of the founding of institutions for that purpose.

Dr. Harris lived to see the high standards that he advocated for the dental profession fully attained, through the untiring efforts of two students who had received their early instruction and inspiration under his guidance and within the walls of this shrine.

Two of Dr. Harris' Bainbridge students, Chapin A. Harris and James Taylor, founded, respectively, the Baltimore College of Dental Surgery, in 1840, and the Ohio College of Dental Surgery, in 1845, the first two dental colleges in the world.

John Harris had acquired his knowledge of dentistry from itinerant dentists while practicing at Madison, near Cincinnati, Ohio. He had devoted more than half of his time to the practice of dentistry since 1820, according to his announcement published in 1830, citing prominent citizens as references.

In the year 1830, dental activities in Bainbridge had come to a close, John Harris having removed to Chillicothe in May of that year. Later, 1835-1836, while practicing at Georgetown, Ky., he made an unsuccessful attempt to secure, through the legislature, a charter for a dental college. And it may be of interest to know that an attempt was made to have an act passed to regulate the practice of dentistry in Kentucky at that time. The records do not say who was responsible for the bill, but Dr. Harris was in Frankfort, the capital, at that time.

According to an obituary of John Harris, probably by C. O. Cone, then of the *American Journal of Dental Science* and a former associate of Dr. Harris, the latter began the practice of dentistry about 1821. The obituary was copied in its entirety in the *Dental Register of the West* by James Taylor, editor, and a former student of Dr. Harris. This date, and other statements in the obituary, must have been right; otherwise, Dr. Taylor would have made proper corrections.

MEMORIAL CEREMONY DEDICATION OF THE CRADLE OF DENTAL EDUCATION

Community Hall, Bainbridge, Ohio,
November 24, 1940

THE president of the Ohio State Dental Society, Dr. Van B. Dalton, called the meeting to order.

A radio program commemorating the Anniversary of Dental Education was presented over the National Broadcasting System, depicting the origin of dental education by John Harris at Bainbridge.

The Rev. Charles Longbrake, of Bain-

bridge, was called upon to pronounce the invocation. Dr. Dalton then made a few remarks, stating that the church in which dinner had been served was a part of the original church where John Harris attended religious services.

Dr. Dalton then introduced Edward C. Mills as chairman of the Dedication Committee and turned the meeting over to him.

Dr. Mills: Mr. President, guests, and members of the Ohio State Dental Society: It is indeed a pleasure to take over the exercises at this time, as this marks the culmination of a great deal of effort on the part of many of us, extending over a long period of time.

About fifteen years ago, a tablet was placed on the front of the building in which we are meeting today, commemorating the fact that this village is closely identified with events which contributed to the development of dentistry as a profession; and no doubt the placing of this tablet led to the christening of Bainbridge as the "Cradle of Dental Education."

At that time, we were like one searching for knowledge on an ocean beach, while the great sea of information lay open before him. The search for knowledge had scarcely begun; but during the past fifteen years, every few months, the searchers were rewarded with substantiation of the claims that have been made for Bainbridge in its relation to dentistry and the pioneer dentists whose activities began here.

The building that we are dedicating today as a shrine to dentistry must be at least 125 years old. I am told it is the oldest building now standing in the village. I have studied the abstract, but found no way to approximate the year in which the building was erected. We have endeavored to restore it as a creditable memorial to dentistry, and one that will endure throughout the ages to follow.

Fig. 1.—Office and school of John Harris, "The Cradle of Dental Education," Bainbridge, Ohio.

The dental profession throughout the United States and in many foreign countries have their thoughts centered on Bainbridge today, and I might add that the broadcast which we heard as preliminary to these exercises is but a part of the publicity that has been given to the event which we are celebrating today.

The first speaker is a man who is considered an outstanding dental historian. He has always been firm in the belief that our claims in regard to the activities at Bainbridge are well-grounded. It is a pleasure to present B. W. Weinberger, of New York City.

THE CRADLE OF DENTAL EDUCATION IN AMERICA

By BERNHARD WOLF WEINBERGER, D.D.S., New York, N. Y.

Learning, as with water, is never more fair, pure, and simple than at its source.—Naudé.

BACK in 1929, I had the pleasure of compiling the story of John Harris and his place in American dentistry. Much controversy was aroused as a result of this compilation, but I feel today, as I did then, that this man, unknown and forgotten until then, deserves a place among dentistry's immortals.

May I be permitted here to express to the donors of this building, the Ohio State Dental Society, the appreciation of many of us in the dental profession for the purchase, restoration and bequest to posterity of this fine heritage. Libraries and medals bear the names of many of our illustrious practitioners, but I believe this to be the first structure so consecrated.

This building, originally occupied by John Harris, a physician, first served medicine and then dentistry. Between times, private classes of medical students were here given their first medical instruction prior to entering a medical college, the one requirement being that they possess at least "a first rate English education."[1] Here one finds a definite standard established for entrance, which no doubt was likewise the requirement for those who later came under Harris' tutelage in dentistry. We cannot find that there was until then any established requirement of those entering the practice of dentistry, a point of great importance when we consider John Harris' contributions to dentistry.

What event or circumstance influenced John Harris to gradually turn from medicine to dentistry, history unfortunately does not record. James Taylor, one who knew him well and was also one of his students, and later to become one of our most important figures, speaks of him thus:

In giving place to the following obituary notice of Dr. J. Harris, we feel compelled, from a sense of justice to the memory of one we knew so well, to add a few remarks.

We first knew Dr. Harris in 1825, shortly after his location in Bainbridge, Ross County, Ohio, at which time we entered his office as a student of medicine, and from a long and intimate acquaintance since, with the medical profession, we must say that we know of none better calculated to advance a student in his studies. . . . The success of his practice in medicine was the result of his thorough knowledge of his profession, and we have always thought, had he devoted himself exclusively to the practice of Medicine and general Surgery, that he would have soon enjoyed an enviable reputation. His attention, was, however, turned more especially to the specialty of Dentistry, and our profession might date much of its present advancement to his unwearied zeal.

The following obituary notice first appeared in the July issue of the *American Journal of Dental Science*, 1849, pages 383 to 385, and was reprinted by Taylor in the *Dental Register of the West*, 1849-1850, pages 49-52.[2]

This obituary, which we present almost in full, was prepared as a tribute to a fellow member of the American Society of Dental Surgeons "of which he was an efficient and useful member." It was written not by Taylor, but by one who signed his initial C. Just who

that might be, we can only surmise. According to page 210, April 1850, the *American Journal of Dental Science,* C. O. Cone was a member of the Committee on Journal; therefore it would not be illogical to believe that he was the writer.*

OBITUARY NOTICE OF JOHN HARRIS

About the year 1821, his attention first began to be directed to dental surgery; but he did not wholly relinquish the practice of general medicine until about the year 1827. He had, however, by this time, acquired considerable reputation for skill as a practitioner of dentistry. . . .

In dental surgery, Dr. Harris was principally his own instructor, and although he had read the best works then extant upon the subject, and obtained from an itinerant dentist some knowledge of the constructive branches of the profession, he, nevertheless, was compelled almost entirely to rely on deductions drawn from medical and surgical facts, and his own observations, for theory to guide his practice. . . .

Few have ever commenced the practice of dental surgery with so high a reputation for skill as a physician and surgeon, as Dr. Harris commanded; and it was in this connection that the profession gained much; his influence increased the popular respect for the dental practitioner and the estimated importance of his duties. In the year 1835-'36, he prepared a series of articles, which were published in the "Kentucky Commonwealth,"† printed at Frankfort, explanatory of the dentist's professional acquirements, denying the truth and justice of the popular opinion, that awarded to mechanical tact the chief credit of successful dental operations, and setting forth the true character and scientific position of the regularly prepared and faithfully qualified dental practitioner.

There has been some question as to Harris' position at Transylvania University. The unidentified writer, speaking of a fellow member of the American Society, continues:

Agreeably with these views, he made an effort, in 1836, to obtain a charter for a dental college in Kentucky, with means for teaching and powers for graduating for practice the dental student; and although this effort to secure legislative privileges for educating the dentist was unsuccessful, still it is worthy of remembrance, as being the first effort, in this country, to establish an institution of this kind.

During the winter of 1835-'36, in compliance with a request of the Faculty and Students of the Medical Department of the Transylvania University, Dr. Harris delivered a course of dental lectures before the medical class of that institution. These lectures, probably, are marked as the first successful effort at a systematic course of teaching dental surgery in the west, if not in the United States.

About ten years later, Taylor, in a review of the "Life and Character of Chapin A. Harris," again refers to his early preceptor[3]:

In this latter year (1827) the former (John Harris) turned his attention to the practice of Dental Surgery. He had acquired considerable reputation as a general surgeon, and was a skilful and ready operator. He was much devoted to the study of anatomy and chemistry, fond of experimenting, had a quick and active mind, was polished in his manners, delighted in imparting instruction to his pupils, devoted much time to their interests, and prided much in their advancement in medical knowledge. At that time he had three or four students, two of whom followed his example in the pursuit

*In Burton Lee Thorpe's History of Dental Surgery, Volume 3, 1910, one finds further confirmation that Cone might have been the writer of the obituary notice. On page 266, Thorpe writes: "[Cone] went to Baltimore and attended lectures at the Baltimore College of Dental Surgery, from which he graduated April 15, 1845, with honors. Immediately following his graduation he went to Georgetown, Ky., where Dr. John Harris (a brother and preceptor of Chapin A. Harris, also preceptor of James Taylor, John Allen, and others of the best men of the day), who was to absent himself from his practice for a year, turned his practice for that period over to the care and skill of Dr. Cone, whom he recommended to his clientele through the newspapers as a 'man of moral and professional worth'; with the endorsement of this worthy man, Dr. Cone . . . commanded a busy practice."

†D. Cosmos, 71:572, June 1929.

of dental knowledge, myself being one of them. . . .

Dr. John Harris and myself had many protracted discussions on the importance of a thorough medico-dental education, and the best method of securing it; and in these we were joined by Dr. C. A. Harris, on one or two occasions, or perhaps oftener.

I do not believe that, at this late date, any one will question Taylor's motives in recording this message. Thus, within this building, the rudiments of dental education in America had their conception and foundation, and here the first independent teaching institution was established.

From here came forth some of our foremost early dental educators. However, let us first follow the sequence of this development, and later I shall revert to the influence of John Harris and his experiment; for experiment it was, but one that was to play a most important part in the changes in dentistry that soon afterwards brought American dentistry to the front.

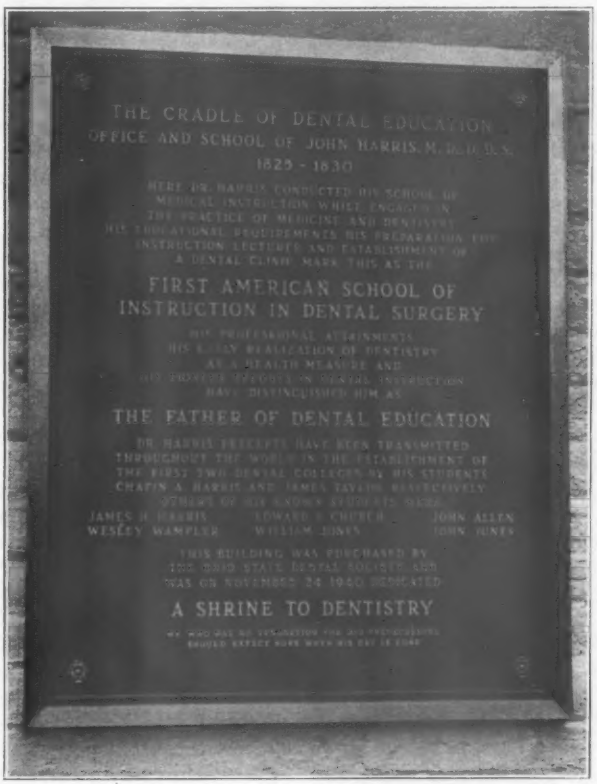

THE CRADLE OF DENTAL EDUCATION
OFFICE AND SCHOOL OF JOHN HARRIS, M. D. D. D. S.
1825 - 1830
FIRST AMERICAN SCHOOL OF
INSTRUCTION IN DENTAL SURGERY
THE FATHER OF DENTAL EDUCATION
A SHRINE TO DENTISTRY

Fig. 2.—Tablet placed by Ohio Dental Society on the "office and school of John Harris," Bainbridge, Ohio.

As we assemble to dedicate a new shrine to dentistry, it might be fitting to review the early history of dentistry and dental education in this country.

In tracing significant aspects of the practice of dentistry in the American Colonies and the period up to 1820, the time of the establishing of the first dental school, it is important to realize first the

medical practice of the same period. It is against this background that the practice of dentistry must be projected.

For the first hundred years or more, much of the medical care in the colonies was supplied by the clergy. They were almost without exception highly educated. Many of them before coming to America had studied medicine, and they continued to act in the capacity of doctors down to the beginning of the last century.[4] The doctor of the seventeenth century was a physician, chirurgeon or barber-chirurgeon, the designation of doctor not coming into use in America until about 1769. It is important to note that, like the early colonial practitioner of dentistry, the medical man then did not confine himself entirely to his profession, but with it often combined some form of manual labor, or was part owner of a general store.[5]

In medicine and in law, the preceptor system for training physicians and lawyers continued far into the nineteenth century, even after the medical colleges and law schools were well established. It was not necessary to attend a medical college to obtain a medical education: it was only necessary to find a practicing physician willing to take one in as an apprentice. All that was required was to "read medicine." Reading in those days was much like the hospital internship of the present day, for it gave one clinical experience and contact with actual practice.

About the year 1700, in France, individuals destined for the practice of dentistry were compelled to undergo a regular examination, the same as the physicians and the surgeons. From this time on, dentistry there assumed an importance it had nowhere else in the world, attracting to its membership men medically educated, of broad culture, marked ability and the highest artistic attainments. It was this type of person that came to America during the last half of the eighteenth and the beginning of the nineteenth centuries, and such early dental pioneers as John Baker, James Gardette, Jean Pierre Le Mayeur and others who obtained their medical degree before coming to this country considered dentistry a profession and not a craft.

In this country, up to the year 1819, there were comparatively few dentists practicing, and these had principally obtained the knowledge they possessed from practitioners of the art in Europe. As late as the year 1830, the means of obtaining information upon such subjects as related to dental surgery were extremely limited. In all of our large cities were to be found a few men who, having possessed themselves of what might be called the theory of dental science, had put it in practice, and by much energy, perseverance and skill, were enabled to add greatly to the information which had been imparted to them by their instructors. These men became teachers in their turn, but like those who had trodden the ground before them, their time and skill were needed and demanded by their patients, and the number of students to whom they could give proper attention was by far too small to supply the demand for dentists, and a host of pretenders rushed in to supply the deficiency.

In 1818, Levi Spear Parmly, returning from London after seeing results of the lectures given by those practicing in England, introduced the lecture system into American dentistry. This attempt was the first, as far as I can find from present material gathered on the subject, to be made in America. These first lectures, however, were designed for instructing the public as to what constituted the proper practice of dentistry.[6]

Later, the experiment of teaching dentistry by means of lectures in medical colleges was tried, but it became obvious to those who attempted it that it was ineffectual as far as the main object

was concerned, and was attended with one disadvantage which would of itself more than counterbalance the good to be derived. The percentage of those attending medical college for the benefit of dental lectures was exceedingly small, and those who attended for the purpose of perfecting themselves in the various branches of medicine took but slight interest in the dental course.[13]

Two of the foremost exponents of these early medical courses were Horace Hayden and John Harris. Let us follow each in this respect. An advertisement of a Mr. Hamilton that appeared August 16, 1800 in the *Baltimore Telegrapher* reads: "From the various and frequent applications which he has received, many of which not being able to attend to, he has employed as an assistant Mr. Hayden, whose experience as a Dentist, in the northern states . . . insured him great success." Thus we find Hayden beginning what was to be a long and successful practice of dentistry in Baltimore.

This is not the time to again go into a lengthy discussion of the exact date when Hayden undertook to deliver lectures before medical students. That he did "deliver to a few medical students of the University of Maryland some lectures on Dental Physiology and Pathology"[7] is the important fact at present. Hayden's teachings before the medical students pertained only to dental physiology and pathology, and were not instructions in the art and practice of dentistry; an important fact at this time. Although there is a statement that Hayden "was accustomed to hold classes in dentistry in his office at night with no light but the tallow dip," of these classes we have no further information.[8]

We are a little more fortunate as far as John Harris' activities are concerned, having access to the printed statements of some of his students already mentioned.

It has been said of the historian that he writes in the present of events selected from the past, with the hope that his interpretation and revaluation may serve as a guide to the future. Such a thought permits me to present the brief history just related, and from it to conclude that until John Harris entered into active medical instruction and then dental, no one, as far as records disclose, succeeded with a plan that actually did enable well-educated and capable men to carry on.

My views regarding the importance of John Harris and his true place in American dentistry were published in 1929.[9] Those of Edward C. Mills are even better known in this state.[10] Therefore, at this time, I quote a statement just recently made by L. Pierce Anthony, for it sums up the story in a concise manner[11]:

> Practically coincident with, but in no way, to our knowledge, related to this more or less abortive effort at organization in the east, there was developing a dental relationship to medicine in the middle west that was destined to become epoch-making and profession making. In the little town of Bainbridge, Ohio, there was evolving the thought that dentistry was of sufficient importance to be practiced and taught separately from medicine. John Harris, a highly reputable physician of Bainbridge, had given considerable attention to dentistry in association with his medical practice and became so impressed with the possibilities of dental practice that he essayed to instruct a group of medical men in the art of dentistry. After several efforts in this direction, and with continuing success, he sent forth a number of medical men equipped and qualified to practice dentistry on the same professional basis as medicine of that day was being practiced, and among the group, so taught, was the brother of John Harris—Chapin A. Harris—who later removed to Baltimore and began to practice dentistry.

The names to which Dr. Anthony alluded are[12]:

Chapin A. Harris, M.D., D.D.S. (1806-1860), co-founder of the Baltimore College of Dental Surgery 1840,

first dental college in the world; first editor of the first dental journal, *American Journal of Dental Science;* author of the first dental dictionary, "Dental Art," etc.; president of the American Dental Convention, 1857.

James Taylor, M.D., D.D.S. (1809-1881), founder of the Ohio College of Dental Surgery, 1845, at Cincinnati, Ohio, the second dental college in the world; first editor of the *Dental Register of the West,* the second dental journal; charter member, Mississippi Valley Association of Dental Surgeons, 1844; president, American Dental Convention, 1856.

James H. Harris, M.D. (1795-1836), practiced medicine, Columbus, Ohio, 1822; Lancaster, 1827; treasurer, Thirteenth District Medical Society, practiced dentistry, Lancaster, 1828, and later in Baltimore, until his death; author of "Essay on Importance of the Teeth—Their Diseases and Curative Indications."

Joseph Taylor, D.D.S. (1806-1873), practiced in Vicksburg, Miss.; Maysville, Ky., and Cincinnati, Ohio, 1850-1859, with his brother James; charter member, Mississippi Valley Association of Dental Surgeons; at Maysville, Ky., prepared artificial jaw teeth and palate for man who had lost a large portion of the lower jaw and palate from a gunshot wound.

John Allen, M.D., D.D.S. (1810-1902), "perfecter of porcelain dental art"; one of the founders of the Ohio College of Dental Surgery; practiced in Cincinnati and New York City; inventor of "continuous gum" work; president, American Dental Convention, 1861.

Edward P. Church (1805-1832), native of New York; practiced in Natchez, Miss., Memphis, Tenn., Kentucky and Western New York; invented forceps for extracting the upper third molar, which in 1849 were used by the majority of dentists in the United States.

Wesley Wampler (1806-1875), native of Virginia, located at Milton Station, now Humboldt, Ill. Here he extracted with a turnkey, in 1856, the first tooth that Abraham Lincoln had extracted by a dentist.

John Jones, D.D.S. (of Dayton, Ohio) (1795-1850), graduated in first class Ohio College of Dental Surgery in 1846; practiced in Miamisburg and Dayton, Ohio, with another dentist (Dr. Satterthwait); introduced a resolution at Mississippi Valley Association of Dental Surgeons, which marked the beginning of our Code of Ethics; was preceptor to several, and "was a man highly esteemed in professional and private life."

William Jones, M.D. (Kenton), the only known student who did not follow dentistry; practiced in Kenton, Ohio, 1848, until his death about 1874; Charter member, Hardin County Medical Society, 1850, and five times president; assistant surgeon, one hundred thirty-fifth Ohio Volunteer Infantry; published in *American Journal of Dental Science,* 1853, "A Case of Reproduction of the Inferior Maxillary Bone Following Necrosis."

With such a distinguished list of students, Taylor's appraisement of John Harris cannot be wrong. He is entitled to the credit of making the first move in the direction of establishing a system of instruction that gave credit and stability to our profession. The mere fact that one of Harris' students in the East was co-founder of the first dental college, editor of the first dental journal and active in the formation of the first national dental society, while two others, Taylor and Allen, contributed likewise in the west, shows that the system of instruction by John Harris must have been sound and effective.

Of John Harris' writings much might be said, but these opinions have already appeared in print [9, 10] and therefore I shall only note here that, as early as 1845, he called to the profession's atten-

tion the injury sustained in retaining non-vital teeth; a warning which remained unheeded until 1910, when Hunter made his now famous contribution to the subject of oral sepsis.

In a recent article *(Proc. D. Cent. Celebration,* 1940, p. 872) one reads that "John Harris was enrolled there (Transylvania University) in 1835-1836 as an undergraduate medical student." In the "Catalogue of the Officers and Students of Transylvania University," published in Lexington, Ky., January 1836, and also in a "List of Graduates in 1838" and undergraduates in 1836, the name of one John M. Harris, of Richmond, Ky., whose preceptor was a Charles J. Walker, M.D., appears.

Can he and John Harris of Bainbridge be the same individual, or is it a case of mistaken identity? The record is clear as to where John Harris practiced, and a little study reveals that from 1834 to 1840 he was a resident of Louisville, Ky., a member of the "Firm of Harris and Hobbs." However, during the sessions of the legislature he practiced in Frankfort, Ky., and thus he could not have matriculated from Richmond, Ky.

Secondly, in no single advertisement, articles published in dental journals, the Index of Dental Periodical Literature 1839-1875 (1923), obituary, Masonic record and his designation as the first man to be elected to membership in the American Society of Dental Surgeons *(American Journal of Dental Science,* 1:168) does the middle initial "M" appear.

Thirdly, it would hardly seem necessary for one who taught medicine from 1823 to that date to be required to have a fellow physician sponsor him as a preceptor.

The idea of transforming this old building into a memorial to John Harris, who long years ago frequented it, who had there done much of the work for which he was famous and whose memory hallowed it, was the inspiration of members of the Ohio State Dental Society. The thought of restoring such a dilapidated building and dedicating it as a memorial may have shocked some people and made others smile. Members of the society did not despair, but through their enthusiasm were able to announce, in 1938, that the society had purchased it, that it would not only rehabilitate the edifice, but would "convert it into a museum and shrine, preserving for posterity this fine heritage and commemorating the activities of those pioneers in the promotion of Dental Science."

I congratulate your society on its successful efforts, for today you must be happy as well as proud.

May this "Cradle of Dental Education" serve for all time not only as a memorial to John Harris but also as an inspiration to the future of dentistry.

To John Harris, the founder of American dental education, may it be a lasting memorial.

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119 West 57th St.

Dr. Mills: Dr. Weinberger, on behalf of the Ohio State Dental Society and my committee, I thank you. At this time, I am going to ask the mayor, Hon. Lloyd Stevens, through his proxy, the Rev. Charles Longbrake, to extend the official welcome.

Speaking for Mayor Stevens, Mr. Longbrake said in part:

It is a great honor that I have this afternoon in welcoming you here and accepting for our village of Bainbridge, the museum and shrine that the members of the Ohio State Dental Society are dedicating today.

To know that education in the science of dental health had its beginning here in Bainbridge makes us proud indeed; and that, from this small beginning, this profession has grown to be one of the greatest in our country is certainly inspiring.

On behalf, then, of the citizens of Bainbridge, I extend a welcome to all who now and in the future come to pay homage to this pioneer in dentistry and to view the "Cradle of Dental Education."

Dr. Mills: The next speaker is the immediate Past President of the American Dental Association, the recipient of the Callahan Award during our present meeting in Cincinnati. He is the author of several works, one of which is entitled "Periodontal Diseases."

It is unnecessary for me to add that most of you know Dr. Merritt either personally or by reputation. It gives me great pleasure to present you, Dr. Merritt, and I hope that you may become imbued with the Bainbridge spirit before you leave Ohio.

Dr. Merritt: I am already thoroughly imbued with this spirit.

Dr. Merritt then presented his address on "John Harris, Dental Educator."

JOHN HARRIS: DENTAL EDUCATOR

By ARTHUR H. MERRITT, D.D.S., New York, N. Y.

IT is altogether fitting that we, as representatives of the dental profession of the present, should take an active interest in keeping alive the memory of those who made substantial contributions to its progress. Throughout the year 1940, American dentistry, in celebrating its centenary, has had occasion to pay its tribute of respect to those who, in the past, have made possible the almost incredible achievements of the last century. These accomplishments were not the work of one man, nor were they along identical lines. They represent the ideals, labor and vision of many, working in different fields, but with a common objective, the advancement of dentistry.

One of these was John Harris. No one can study the record of his life and not be impressed with his interest along many lines, especially in the field of den-

tal education. Indeed, he has been called the "Father of Dental Education" in this country, having been among the first to appreciate its importance for the elevation of dentistry to the status of a learned profession. The question then, as it has been for more than a hundred years, was what kind of training should be given the dentist to qualify him to meet the responsibilities of daily practice. There were then, as there are now, those who sincerely believed that dentistry should be made a specialty of medicine. John Harris, who for several years practiced medicine and surgery, appears to have been among those holding to this belief. "He pointed out to the members of the profession," so it is said, "the importance of a systematic course of (dental) instruction with an especial application of medical and surgical teaching to the wants of the dental surgeon."

In the "Life and Character of Chapin A. Harris," the statement is made by the author that "Dr. John Harris and myself had many protracted discussions on the importance of a thorough medico-dental education and the best method of securing it." Just why, in the light of opinions such as these (and they seem to have been shared by a considerable number at that time), dentistry should have embarked on a separate educational course is not entirely clear. In an attempt to explain it, the statement has been made, and often repeated, that an effort was made to establish a chair of dentistry in the medical school of the University of Maryland and that the proposal to do so was rejected with some deprecatory remarks. This has been denied, with the statement that there is no proof that such was ever the case and with the implication that the separately organized dental school represented the mature judgment of those early pioneers. Whether this is true, the fact remains that, from that day to this, there have been those who believed that this educational separation from medicine was a serious mistake.

It is out of this belief that various attempts have since been made to bring dentistry back into the fold of medicine, of which it was originally a part. The obstacle to such action has always been the economic difficulty of educating the dental student in both dentistry and medicine. This cannot be done in the time required for graduation in any other profession, with the logical result that the number of those entering upon the study of dentistry would be more or less seriously curtailed, when the need for more dental practitioners was never greater. To meet this situation, there have been those who would separate dentistry into several groups with varying educational levels, one of which would be medically educated. Surely no one having the interest of the public at heart can seriously consider such a course. It would only serve to make confusion worse confounded.

Out of the perplexity created by this situation, one thing at least would seem to be clear; namely, that the dentist of the future will need to be more broadly educated along the lines of general medicine if he is to successfully meet the increasing responsibilities of present-day dental practice. He must, in a word, be so trained that his comprehension of, and interest in, the biologic problems of dentistry shall be as great as in the more obvious technical procedures that are inseparable from dental practice. How this shall be done, whether as a specialty of medicine or in separately organized schools as at present, is still a matter of controversy. That it must be done, all, I think, will agree. Our attitude as a profession, it seems to me, should be one of open mindedness. If, by some plan, radically different perhaps from any now in operation, the dental profession can be trained to give better service, all things considered, than that now being given, we who make up the profession of

the present should welcome the change. Nor should we forget that any plan of dental education will succeed or fail according to the way in which it serves the interests of the public, for it is the public and not the profession who will, in the end, decide the question.

These, I believe, are some of the things John Harris had in mind in urging the "medicodental" education of those entering upon the practice of dentistry. Should we not, therefore, as we today dedicate this building in which he labored for the educational betterment of dentistry, rededicate ourselves to the same ideals which characterized him, to the end that we too may serve more acceptably?

Dr. Mills: Please accept our sincere thanks, Dr. Merritt, for your address.

Several years ago, I had the pleasure of a trip through the South and, during that time, I made a special visit to the town of Hertford, N. C., which was one of the objectives of my trip. I had had some correspondence there with Mr. J. S. Vick, and together we endeavored to locate the exact spot where John Harris is buried. I examined the minutes of the Masonic Lodge pertaining to his burial, and found that his remains rested in an unmarked grave in the town cemetery.

Today, in recognition of the activities of Dr. Harris in the eastern part of the state, North Carolina has delegated the next speaker to represent it. We are fortunate in having with us this afternoon a man who has made a great impression on the dental profession in North Carolina and who is the author of "History of Dentistry in North Carolina," a volume of several hundred pages, and one of the best histories of a state dental society that have been published. I take pleasure in introducing J. Martin Fleming, of Raleigh, N. C.

Dr. Fleming read a paper on "John Harris."

JOHN HARRIS

By J. MARTIN FLEMING, D.D.S., Raleigh, N. C.

THE North Carolina Dental Society feels honored that it has been asked to send a representative to such a historic occasion and I feel doubly honored that they have sent me to represent them. It affords an opportunity for meeting new friends and of renewing acquaintance with old ones whose friendship I prize.

Among these is my old friend, E. C. Mills, who is probably most responsible for this meeting, and from him I have learned a greater love for things historical, with a more earnest desire for their preservation.

North Carolina not only feels honored that the remains of Dr. Harris rest within our borders, but also we come acknowledging a debt of gratitude and a lasting obligation which we owe to his memory. He came to our state when the practice of dentistry was in a more or less chaotic state and he set for us a high standard of ethics, which we have striven to maintain.

In my young manhood, it was my privilege to practice in a town with Vines E. Turner, of Raleigh, N. C., who at one time was President of the American Dental Association. He was a man of wonderful memory and a historian of note. It was from him that I learned much of the early dental history of my

state. Dr. Turner was not old enough to have been practicing during the life of Dr. Harris, but he began his practice only a few years afterwards and practiced with many men who were his contemporaries, and there is no doubt that he knew of the life of Dr. Harris and of its influence on the early practitioners of North Carolina.

It seems that Dr. Harris pleaded at all times for an educated profession and advocated such a course on every possible occasion. That his teaching had good results is seen in the fact that, in the second class graduating from the Baltimore College, was found one North Carolinian, and almost each succeeding class graduated one or more men from my state. The class of 1855 contained ten men from North Carolina.

In the light of these facts, it is not claiming too much to say that Dr. Harris was responsible for much of this awakening and that his influence, living after him, had much to do with our earliest organization in 1856, just a few years after his death.

This organization was unique in that its membership was limited to graduate dentists. That, it seems, was a tribute to his earnestness of purpose in advocating both an educated and an organized profession.

But to come back to Dr. Turner: In "Koch's History of Dental Surgery," published in the early part of this century, Dr. Turner said: "Among the earlier practitioners of dentistry in North Carolina were to be found gentlemen of the very highest culture and refinement, having had in several instances educational advantages sufficient to qualify them to enter any of the learned professions. Among these was Dr. John Harris, a brother of Dr. Chapin A. Harris, who made frequent visits to North Carolina." Dr. Turner's article relates "Only a small portion of the population of North Carolina, as was the case in most of the slave states, was able to pay fees then exacted by qualified dentists for their services. . . . Those who made up the patrons of the dentists thus were the wealthy and cultivated classes, whose confidence and esteem could only be enlisted by the intelligence and high character of the dentists themselves."

The eastern section of our state, "The Albemarle Section" as we know it, presented a fertile field for such a dentist. It was a rich farming section, peopled by the very highest type to be found anywhere.

It was to such a community that John Harris came, about 1838. Dr. Turner says of him that he made frequent visits to this section and "from the first he seemed to have won and held the confidence of a large number of patrons and his name is thus creditably associated with the early history of Dental Surgery in North Carolina."

There were quite a number of other itinerant dentists who came to North Carolina in those early days, but none who stood higher in the esteem of the community than Dr. Harris. With men of this type practicing in the state, you can readily see what an easy transition it was to change a craft to an honored profession.

It was while Dr. Harris was on one of these visits to eastern North Carolina that he was taken sick and died. He was buried in the village of Hertford, N. C., July 26, 1849.

And so North Carolina comes today to do homage to this man and to acknowledge the debt that our state owes to his memory. We are proud of the fact that his dust rests within our borders and we look forward to such time, in the not too distant future, when we may join hands with Ohio, if not with the rest of the nation, in placing a suitable memorial to him in the town in which he lies buried.

Dr. Mills next presented L. Pierce Anthony, Editor of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, Chicago; Wendell D. Postle, dean of the College of Dentistry, Ohio State University, Columbus, Ohio, and Homer C. Brown, Past President of the American Dental Association and the Ohio State Dental Society, all of whom paid their respects to the Harris Shrine of Dentistry.

Dr. Mills: Immediately after this program, we will adjourn to the "Cradle of Dental Education," and I am glad to say we will recognize it as such by holding our first meeting of the House of Delegates there. And, as I have just said, immediately after the meeting, we will go to Cincinnati for the Seventy-Fifth Anniversary of the Ohio State Dental Society.

The year 1940 has been a momentous one in the history of dentistry. We commenced our national celebration in Baltimore, Md., and Ohio was well represented, all paying homage to the occasion. The volume published of the proceedings of that meeting will be of great interest to posterity. The American Dental Association meeting in Cleveland in September was a further observance of the centennial of dentistry. But, to my mind, the dedication of this historic shrine is the crowning event in the celebration of a Century of Dentistry. I thank you.

Assuming the Chair, Dr. Dalton, for himself and as the president of the Ohio State Dental Society, thanked the speakers for their participation in the ceremonies. The Rev. Charles Longbrake was then asked to pronounce the benediction and the meeting was adjourned.

PRACTICE IN PARAGRAPHS

An Inexpensive Gold and Plastic Bridge—Another adaptation of the new dental plastics is the construction of a relatively inexpensive six tooth maxillary anterior bridge. The cuspids are prepared in the customary manner and waxed and three-quarter gold crowns are cast and placed on the prepared teeth. A plaster impression is then taken and poured in soldering investment. Next, a metal bar is adapted to the edentulous ridge and soldered between the cuspid three quarters, joining them together. Any type of denture teeth with pins may be selected and adapted to the ridge and set esthetically. The labial aspect is then waxed to include the bar, invested, boiled out and cured with an acrylic resin. The finished case then set in the mouth presents an inexpensive, attractive bridge which enables the operator to replace any of the pontics with ease in case of breakage.—*Thurston D. Knowles, D.D.S., 177 Post Street, San Francisco, Calif.*

Manipulation of Acrylics—When the monomeric liquid acrylic and the polymeric powder are mixed, it is not the intention that the liquid shall evaporate, but that it shall remain in the mass and polymerize. The mixture should be covered tightly, and if the thickening is too slow, the container can be warmed gently. If the container is left open, the liquid will evaporate and the mixture will be sandy. If the container is kept closed, the mixture will become plastic.

In repairing an acrylic denture, warpage can be prevented by processing the repair at 75° C. for two hours. Cure will be complete. Boiling temperature should be avoided also during flasking and wax elimination. At 75° C., the denture will not soften and warp.—*Alfred T. King, 185 N. Wabash Avenue, Chicago, Ill.*

OBITUARIES

ROBERT BOYD BOGLE, D.D.S.
(1875-1941)

ROBERT BOYD BOGLE, President of the American Dental Association in 1930, died at his home in Nashville, Tenn., May 25, 1941. He was born at Midland, Tenn., March 22, 1875, the son of Robert Caldwell Bogle, M.D., and Mrs. Bogle. His preparatory education was received at Winchester Normal College and he studied medicine at Vanderbilt University School of Medicine, where he received the M.D. degree in 1894. He then entered Northwestern University Dental School, from which institution he received the D.D.S. degree in 1895.

Beginning the practice of dentistry in his native state, Dr. Bogle manifested, from the beginning, an active interest in all important phases of dentistry and oral surgery. After being engaged in the practice of general dentistry for twenty-three years, he entered the exclusive practice of exodontia and radiography, a field in which he excelled, continuing until ill health forced him to retire from active practice in 1932.

Dr. Bogle was professor of exodontia, radiography and mouth surgery at Vanderbilt School of Dentistry from 1905 until 1926 and dean of the faculty for the last seven years of that period. For many years, he was a member of the staff on dental surgery of Vanderbilt, St. Thomas, Protestant and Baptist hospitals, Nashville. He was a leader in the work of the professional associations connected with dentistry and medicine and was former president of the Nashville Fifth District Dental Society, the Tennessee State Dental Association and the American Dental Association. He was a member of the National Association of Dental Faculties, American Association of Dental Schools, Nashville Academy of Medicine, the Tennessee State Medical Association and American Medical Association. During the World War, he was a member of Medical Advisory Board No. 3, of Nashville. Dr. Bogle was an honorary member of the Alabama, Mississippi, Arkansas, North Carolina and South Carolina state dental associations and a life member of the Maryland State Dental Association. He was a member of the Phi Kappa Sigma, Psi Omega and Omicron Kappa Upsilon fraternities and a Fellow of the American College of Dentists.

ROBERT BOYD BOGLE
(1875-1941)

Dr. Bogle spent long years of strenuous service in making dentistry a better profession and more helpful to suffering humanity. His pleasing personality and forceful character made him an effective leader in working to elevate the standards of dentistry, and his activities in the various associations did much to place dental education in its present ad-

vanced position. As dean, professor and teacher, his wisdom and counsel greatly benefited students, practitioners and humanity.

In 1905, Dr. Bogle married Clara Jungerman, who survives, with two children, Dr. Robert Boyd Bogle, Jr., and Mrs. C. Parke Street, and three grandchildren, Robert Boyd Bogle III, C. Parke Street, Jr. and Robert Boyd Street.

OREN A. OLIVER.
C. W. HOFFER.

WILLIAM A. SPRING, D.D.S.
(1866-1940)

THE New York Auxiliary has lost by death one of its well-loved members, Past Grand Master William A. Spring, who died November 22, 1940, at the age of 74.

Dr. Spring was born in Springfield, Vt. He received his professional training in the old Philadelphia Dental College, graduating in the class of 1888. After his graduation, he went to Leipsic, Germany, becoming associated with Dr. Ellery Young. He returned to America in 1890 to marry Miss Blanche Powell, of Richford, Vt. He then returned to Europe, where, after practicing for a few years in Geneva, Switzerland, he finally established himself in Dresden.

He became well known and acquired a distinguished clientele, among his patients being the late Archduke Franz Ferdinand of Austria, who was assassinated at Sarajevo in 1914. At the outbreak of the World War, Dr. Spring and his family returned to New York City, where he established his practice in 1914.

Dr. Spring was elected a life member and initiated into Delta Sigma Delta by the New York Auxiliary in February 1923. The auxiliary was honored to have him as grand master in 1937 and again in 1938.

Dr. Spring was an honorary member of the American Dental Society of Europe, a Fellow of the International College of Dentists and of the New York Academy of Dentistry and a member of the First District Dental Society, New York State Dental Society, American Dental Association and the New England Dental Society, the Vermont Dental Society and the Sleepy Hollow Country Club.

Mrs. Spring and two sons, Henry Powell Spring, writer, of Winter Park, Fla., and Gerald Max Spring, survive.

DAVID W. ADAMS, D.D.S.
(1880-1941)

DAVID W. ADAMS, D.D.S., past president of the Chicago Dental Society, died on April 8 in Grant Hospital, Chicago, after an illness of several months. He was born in Iowa, March 10, 1880, and was graduated from the Chicago College of Dental Surgery with the class of 1902.

Dr. Adams became a life member of the Illinois State Dental Society through the Chicago Dental Society in 1906. His interest in the affairs of organized dentistry was profound, and during his thirty-five years of membership, he was an indefatigable worker in its behalf. He founded the study club of the Chicago Dental Society and was its chairman for six years. He was a member of the board of directors of the Chicago Dental Society from 1934 to 1937 and, in the later year, became the society's president-elect, automatically becoming its highest officer in 1938.

His interest in fraternal and civic affairs kept step with that in dentistry. He was a member of the board of directors of Xi Psi Phi Fraternity for twenty-one years and supreme president of that organization from 1912 to 1914. Dr. Adams was also an active member of the Elks and Masonic lodges.

The widow survives, with two sons, David C. Adams and Arthur Adams. The latter, a member of the Chicago Dental

Society, has been associated with his father during the past two years.

EDWARD TAY TINKER, D.D.S.
(1875-1941)

EDWARD TAY TINKER, Minneapolis, Minn., died May 8. He was born May 5, 1875, on a farm near Ruthven, Clay County, Iowa, and was reared in DeWitt, Iowa. He attended the public schools there and, when 15 years old, entered the office of M. A. Robinson,

EDWARD TAY TINKER
(1875-1941)

with whom he remained for three years, at the same time attending high school.

Dr. Tinker was licensed to practice by the Iowa State Board in March 1894, when he was 18 years old. His first office was in Wheatland, Iowa. During the summers, he practiced dentistry. During the winters, he attended dental college. Dr. Tinker took his first two years of dentistry at Northwestern University and his third year at Iowa. In 1898, he was graduated from the College of Dentistry, University of Iowa.

Until 1908, when he moved to Minneapolis, Dr. Tinker continued his practice at Wheatland. During this time, he was one of the close followers of William H. Taggart in the development of the casting process for gold inlays. Probably one of the most outstanding contributions that Dr. Tinker made to dentistry was his technic for construction of the three-quarter crown. He was in constant demand as a clinician by all the principal dental societies in the United States and Canada.

Prominent in Minnesota dentistry since 1909, Dr. Tinker was president of the Minnesota State Dental Association in 1914. He was president of the Minneapolis District Dental Society in 1918, a member of the faculty of the Columbia Postgraduate School, 1919-1920, a special demonstrator at one time at the School of Dentistry, University of Iowa, a member of the faculty of the School of Dentistry, University of Minnesota, from 1926, and honorary chairman of the Partial Denture Section of the Dental Centenary held at Baltimore in 1940.

He was a member of the American Dental Association, Omicron Kappa Upsilon, honorary dental fraternity, Delta Sigma Delta Fraternity and the American Society of Restorative Dentistry and a Fellow in the International College of Dentists.

Surviving are his widow, Alma K., one son, Harry A. Tinker, D.D.S., of Minneapolis, two brothers, Wrey, of Minneapolis and Arby, of Pocatello, Idaho, and five grandchildren.

DEATHS

BALDWIN, JULIUS, Rochester, N. Y.; New York College of Dentistry, 1918; died January 6.

BASS, R. C., Houston, Texas; died May 13; aged 66.

BRYANT, CORA J., Hoquiam, Wash., formerly of Colby, Wis.; Marquette University Dental School, 1904; died April 2; aged 66.

COLLINS, JOHN J., Chicago, Ill.; Northwestern University Dental School, 1914; died March 26; aged 50.

CONLEY, E. J., Lexington, Ky.; formerly of Milwaukee, Wis.; Northwestern University Dental School; died April 11; aged 63.

DESMOND, T. F., Webster City, Iowa; died February 1; aged 75.

GOBLE, LEWIS S., Rochester, N. Y.; Pennsylvania College of Dental Surgery, 1887; died January 12.

GODEJOHANN, ALVIN, East St. Louis, Ill.; Marion-Sims Dental College, 1898; died March 25; aged 68.

GOULD, S. C., Madison, Wis.; Chicago College of Dental Surgery, 1904; died April 10; aged 65.

GRANT, ELMER L., Columbia City, Ind.; Chicago College of Dental Surgery, 1908; died May 10; aged 61.

GROOM, RAY CLIFTON, Lincoln, Nebr.; University of Nebraska Dental School, 1919; died April 3; aged 46.

GUTHRIE, ALFRED, Chicago, Ill.; Chicago College of Dental Surgery, 1895; died February 9; aged 82.

HARRINGTON, JOHN R., Fort Wayne, Ind.; Indiana University School of Dentistry, 1896; died May 6; aged 70.

HAZELL, EZRA F., Springfield, Ill.; University of Pennsylvania School of Dentistry, 1892; died April 15; aged 67.

JONES, FRANK C., Altoona, Pa.; University of Michigan College of Dental Surgery, 1909; died April 19; aged 56.

KELLY, OSCAR S., Donora, Pa.; University of Pittsburgh, School of Dentistry, 1904; died in April.

LIER, A. CLARENCE, Minneapolis, Minn.; University of Minnesota College of Dentistry, 1912; died recently.

LILLY, EDWIN J., Circleville, Ohio; University of Michigan College of Dental Surgery, 1879; died January 7; aged 93.

LOPER, HERBERT B., Richmond, Ind.; Ohio College of Dental Surgery, 1900; died April 21; aged 64.

MCADOO, WALTER C., Winnemucca, Nev.; College of Physicians and Surgeons of San Francisco, a School of Dentistry, 1921; died March 26.

REHM, HENRY, Chicago, Ill.; University of Illinois College of Dentistry, 1924; died April 8; aged 47.

SALE, FRANK O., Urbana, Ill.; died April 10; aged 84.

SAYLES, J. S., Wisconsin Rapids, Wis.; Dental Department, Tennessee Medical College, 1894; died January 30; aged 72.

SHAW, FRANK I., Seattle, Wash.; Vanderbilt University School of Dentistry, 1898; Harvard University Dental School, 1904; died recently.

SMITH, ALBERT L., Ionia, Mich.; University of Michigan School of Dentistry, 1896; died April 23; aged 70.

SPENADEL, IRVING, New York, N. Y.; New York College of Dentistry, 1917; died April 6.

SPETTEL, CLEMENT JOSEPH, Chicago, Ill.; died February 16; aged 77.

STEIN, B. D., Lancaster, Pa.; Pennsylvania Dental College, 1913; died May 8; aged 48.

STEPHENS, WALTER F., Pen Argyl, Pa.; Temple University School of Dentistry, 1903; died November 23.

SWARR, B. F. L., Lancaster, Pa.; Pennsylvania Dental College, 1904; died February 6; aged 65.

TEMPLETON, HOMER J., Portland, Ind.; Indiana University School of Dentistry, 1900; died recently.

CURRENT LITERATURE

Further Studies on the in Vitro Decalcification of Teeth

By T. W. B. Osborn

This paper is an extension of previous work in which it was postulated that sugars and cereal starches, as they occur in nature, are accompanied by a "protective agent" which acts to inhibit caries. This "protective agent," the author states, is removed by modern refining methods. Since there is evidence that calcium and phosphorus compounds may be the agents in question, this study is concerned with determining the inhibiting effect of these salts. Extracted non-carious teeth were incubated with saliva-sucrose or saliva-refined flour medium mixtures and the various salts tested. The following agents were used: (1) calcium lactate and sodium glycerophosphate, (2) various forms of calcium glycerophosphate, (3) hexose phosphates, (4) lecithin, (4) inorganic calcium and phosphate salts, (6) various calcium: phosphorus ratios, (7) calcium and phosphate, and (8) different calcium salts. The results indicate that phosphate is more effective in inorganic than in organic combination. Calcium is active in certain organic forms, but has little effect in the inorganic form. Phosphates used alone are almost inactive. Calcium compounds are nearly as strongly protective alone as with phosphates.—*J. D. Res.*, 20:59, February 1941.

Virgil D. Cheyne.

Accuracy of Clinical and Roentgenologic Diagnosis of Denal Caries as Determined by Microscopic Studies

By Lester W. Burket

With a histologic study of tooth surfaces as a basis, an attempt was made to establish the reliability of the usual clinical and roentgenologic methods of diagnosing caries. Four hundred and sixty human teeth, obtained at necropsy, were submitted to gross and clinical microscopic and roentgenologic examinations. The gross examination made use of the usual clinical method of examining the tooth surfaces with a sharp explorer. For the histologic study, preparations were cut serially at 12 microns and every tenth section was routinely mounted and stained with hematoxylin and eosin. The roentgenographic examination was made by a method similar to that used in the mouth. It was observed that the clinical method gave a higher incidence of positive diagnosis than did the roentgenologic method. Of all of the teeth examined, carious lesions were discovered in 82 per cent of the group by the basic or histologic examination. The clinical examination revealed caries in 62 per cent of the group, while the roentgenologic examination showed that only 48 per cent were carious. It was further concluded that owing to the impossibility of using the histologic examination clinically, it becomes necessary to combine both the clinical and the roentgenologic methods to assure the highest possible degree of success in uncovering carious lesions.—*J. D. Res.*, 20:71, February 1941.

Harry J. Healey.

Cancer of the Tongue

By Hayes Martin and Everett L. Sugarbaker

This report of 157 unselected cases of cancer of the palatine tonsils should be of interest to all dentists. In reviewing the anatomy, we find that the lymphatics pass from these tonsils laterally to the subdigastric nodes opposite the bifurcation of the common carotid artery, and from here they join the jugular chain of lymph nodes.

The average age of the patients was 57 years and 86 per cent of cases occurred in males. No causative factor was found.

The majority of these cases are in the late stages before being discovered. The most common first complaint was of pain and sore throat, the next most frequent complaint being enlargement of the lymph nodes. The average diameter of the primary lesion on admission was 4 cm. All cancers around the tonsillar ring metastasize early. Histologically, 120 were epidermoid carcinomas,

twenty-two were lymphosarcomas and fifteen were unclassified. There are several conditions that require differential diagnosis and a biopsy is always indicated. Thirteen per cent of the cases were operated on for chronic tonsillitis before admission.

In the treatment of these cases, surgery has proved to be of no avail, and better results have been obtained by the use of radiation, extra-orally and intra-orally. A large amount of radiation is necessary and this gives rise to several complications. The patients usually get a rather severe tissue burn. Other complications are dysphagia, pain, radionecrosis, osteomyelitis, hemorrhage, edema and recurrence.

In a review of this series of 157 cases, a five-year cure was obtained in 18 per cent of the patients.—*Am. J. Surg.*, 52:158-195, April 1941.

E. C. WOODS.

Effects of Continued Cadmium Feeding

By R. H. WILSON, F. DE EDS and A. J. COX, JR.

DURING the course of experimental cadmium feeding, bleaching of the incisor teeth of rats receiving cadmium was an unexpected finding. Further study showed that bleaching occurred rapidly and markedly in the incisor teeth of rats fed diets with added cadmium as cadmium chloride in as low concentration as 0.0016 per cent. This effect was observed with or without the addition of fluorine to the basic diet. The authors believe that the action was probably caused directly by the feeding of cadmium, although they do not exclude an increased activity of fluoride in the presence of cadmium. Other findings include a decrease in growth rate, anemia and cardiac hypertrophy.—*J. Pharm. & Exper. Therap.*, 71:222, March 1941.

N. S. SIMMONS.

Rebuilding the Alveolar Process and the Buccal Sulcus

By ADALBERT G. BETTMAN

IN a case in which all of the alveolar process was lost in the maxilla as a result of an accident, as the patient was unable to obtain satisfactory dentures, surgery was resorted to. As there was much soft tissue around the alveolar process, a small incision was made in the incisal region, the soft tissue being undermined as far back as the tuberosity. Cartilage grafts inserted in these cavities served as a satisfactory ridge. Dentures were made and worn with comfort by the patient for years.—*Am. J. Surg.*, 52:62-65, April 1941.

E. C. WOODS.

Roentgenograms of the Mandibular Condyle and Zygomatic Arch

By FREDERICK R. MCGRAIL and JOSEPH A. DOHERTY

BECAUSE of its anatomic relationship with the skull, it is very difficult to obtain a satisfactory roentgen picture of the mandibular condyle. If it is shown at all, it is usually projected at an obtuse angle to the casette, a disproportion of the whole jaw resulting. However, a good film can be obtained by projecting the central x-rays through the temporal bone of the opposite side and the condyle to be roentgenographed, to an adjacent casette. Lack of movement of the condyle between roentgenograms taken with the mouth open and with it closed constitutes evidence of fracture.

The zygomatic arch is easily examined by directing the x-rays downward through the arch to a film held between the teeth and slid well out into the cheek.—*Am. J. Roentgenol. & Rad. Therap.*, 45:637, April 1941.

Herpetic Stomatitis (Aphthous Stomatitis)

By ARTHUR R. WOODBORNE

HERPES simplex and aphthae have much in common: onset with vesiculation, burning pain from the beginning, a tendency to recur, local irritation as a frequent agent in precipitating the attack, association of the recurrent lesions with the menstrual period and association with acute fevers.

Twenty-two cases are reported of the treatment of herpetic stomatitis with vaccine virus. Since all cases showed such an excellent response to the vaccine virus treatment, the author concludes: "1. Aphthous stomatitis is actually herpetic stomatitis due to the virus of herpes simplex. 2. All types of aphthous stomatitis, including the solitary, recurrent and Mikulicz types and periadenitis mucosa necrotica recurrens, should be grouped together, as they respond equally well to treatment with vaccine virus. 3. The disease should be called herpetic stomatitis."

—*Arch. Derm. & Syph.*, 43:543, March 1941.

N. S. SIMMONS.

Partial Hypoplasia of the Lower Jaw

By KARL GOLDHAMER

A RARE case of congenital deficiency of the condyle and ascending ramus is reported because of its importance from a diagnostic and roentgen point of view. A man, aged 20, with a history of good health, had, since childhood, observed unequal movements of the temporomandibular joints. Clinically, pain and some crepitus were localized in the right articulation. A roentgen examination revealed a normal left articulation, but a decidedly underdeveloped right condyle, neck and ramus. The teeth on both sides of the mandible were normal. Treatment, which was necessarily symptomatic, consisted of light massage and short wave and roentgen therapy, with only temporary relief.—*Am. J. Roentgenol. & Rad. Therap.*, 45:563, April 1941.

H. B. MCCAULEY.

Sectioning and Planing Machine for Planoparallel Tooth Sections

By WILLIAM LEFKOWITZ

THE author presents an improved method for the preparation of ground tooth sections, which are important for study in conjunction with decalcified sections. Although decalcification offers a great advantage in the number of microsections available, the enamel is destroyed by decalcification and the dentin undergoes certain changes so that differences of young and old (metamorphosed) dentin cannot be observed as is possible in ground sections. Vital staining of teeth is more accurately displayed in ground sections than in decalcified ones.

Since diamond powder has the properties of hardness and of adhering to the surface of metals, a phosphobronze disk, 150 microns thick, charged with 300-mesh diamond dust, was used on the section cutter in place of the thicker carborundum-vulcanite wheel, because it is thinner, generates little heat and eliminates waste. Sections as thin as 250 to 400 microns were cut, affording four times the number of tooth slabs as the carborundum wheel. Tooth slabs were then polished on one surface and attached to a specimen carrier. The carrier was covered with Canada balsam, heated to 100° C. and allowed to cool to 60° C. The tooth slabs were placed on its polished surface, covered by paper and held in place by a sheet of metal with pressure as it cooled slowly. The polished surface was thus in contact with the carrier so that grinding on the opposite surface of the slab insured planoparallel grinding. In the planing machine, the section thickness was predetermined by a micrometer attachment on the upright arm bearing the section carrier. Horizontal revolving grinding laps of varying grades (coarse to fine) were used with a constant flow of water and abrasive to prevent the heat of friction. The finished ground specimens were washed, polished and soaked off the carrier in a xylene bath. More than 500 uniformly planoparallel sections have been made, showing equal thickness in crown and root regions.—*J. D. Res.*, 20:77, February 1941.

SAMMY MAX STARCHER.

Medical and Dental Services for Dependent Children Under Public and Private Child Caring Agencies

By LAWRENCE C. COLE

THE community, according to this author, is obligated to care for children whose parents are unable to give them adequate medical and dental care. Today, most of the child-placing agencies are functioning to meet this necessity, principally through regular outpatient clinics in the hospitals or specialized locations devoted entirely to the preventive care of the child. The Cleveland Children's Bureau Clinic has gone a step farther and provided a special department of the dispensary of Lakeside Hospital to afford more ample medical care to dependent children admitted to institutions or placed in foster homes. Provision is made also for dental care. The dental clinic has been operating since 1924. In recent years, it has been expanded to care for many of the newer preventive measures. The medical clinics are divided into one for older children and one for children under 3 years. Complete physical examinations are given before entrance to the institutions or boarding houses. Infant cases are closely followed until 15 months of age. Children too sick to come to the clinic are seen by city or private physician. The dental clinic operates fifteen three-hour periods a week and offers

complete mouth examination, simple prophylaxis and the filling of pits and, when necessary, fissures. Extractions are made when necessary, but orthodontia is not provided. There are four part-time dentists. The 1940 budget to carry all expenses was $16,200. During the year, approximately 3,000 children passed through the older children's clinic and 2,000 were cared for in the dental clinic. "The Administrative Committee" is made up of those in charge of the various clinics or bureaus cooperating. It takes care of the relationships, budget and general administrative duties. Throughout the whole scheme, it is felt that this system operates to the best advantage as it provides the community with an interagency cooperation serving the best interests of the child.—*Am. J. Pub. Health,* 31:477, May 1941.

VIRGIL D. CHEYNE.

Rhabdomyoma of the Tongue

By KURT H. THOMA

THOUGH rhabdomyomas occur rarely in the oral cavity, most of those reported in the literature were in the tongue. The author reviews the theories concerning the etiology of this tumor. A history of trauma is usually related. It may be the exciting factor; but it is possible that the patient first realizes the presence of the tumor only after the part has been injured. Such tumors arise by regeneration of old muscle fibers partly destroyed by inflammation. Congenital rhabdomyomas probably arise from misplaced embryonic muscle tissue or retained myoblasts. Some have been known to metastasize. Epithelioma of the overlying epithelium has been known to occur simultaneously.

The lesion reported in this article was hard, deep-seated, circumscribed and immovable. It was first noted as a hard swelling in the anterior part of the tongue about a year previously. Microscopic examination revealed numerous light granular cells of irregular outline closely packed between the surface epithelium and the muscular layer. Striated fibers extended into the cellular area. Special staining procedures were employed. High magnification showed a transition from the granular cells to striated muscle fibers. A resemblance to Purkinje's fibers was noted in what appeared to be an embryonic muscle syncytium.

The histologic appearance of rhabdomyoma has been described by some authors as indicating a process of degeneration in which the regularity of the striations of inflamed muscle fibers was lost. This report, however, seems to favor the theory of embryonic origin and neoplastic growth.—*Am. J. Orthodontics,* 27:235, May 1941.

HANNAH E. SILBERSTEIN.

Etiologic Role of Chewing Tobacco in Cancer of the Mouth

By H. L. FRIEDELL and L. M. ROSENTHAL

THE chewing of tobacco is by no means infrequent, but the importance of this practice in cancer of the mouth is not reflected with any degree of accuracy in the literature. In Abbe's report, probably the most accurate, there is described the author's experience with 100 patients who had cancer of the mouth, all of whom were habitual users of tobacco in one form or another. In this group, thirteen were tobacco chewers in whom cancer developed at the point where the quid was held. Several reports on experimental carcinoma would indicate that tobacco tar contains a powerful carcinogenic substance. This observation, however, is not in accord with that of all workers. The present authors state that the literature on betel chewing affords further evidence that the practice of chewing tobacco may be the dominant factor in the development of cancer.

The data on eight cases presented in this report support the concept that chewing tobacco is an etiologic factor in cancer of the mouth. The average age of the patients studied was 69 years and the practice of chewing tobacco extended over a period of fifty years. The lesions developed slowly, one patient having had symptoms for eleven years and two others for more than three years. They were slow to invade the neighboring lymphatics, and only one of the eight patients had definite metastasis to the cervical nodes. The lesions on the inner surface of the cheek in the area where there was direct irritation had a distinctive appearance. They were of a papillary verruciform character, covered and surrounded by patchy areas of leukoplakia. Only moderate induration was present, and there was no deep infiltration into the submucosal tissues. The

leukoplakic changes were the earliest manifestations of actual neoplastic change. Histologically, the tumors were well-differentiated epidermoid carcinoma. The therapy was irradiation and there was prompt regression of primary tumors.—*J.A.M.A.*, 116: 2130, May 10, 1941.

VIRGIL D. CHEYNE.

Reduction of Dental Caries by Dietary Supplement

By MARK D. ELLIOTT and DOROTHEA NICOLL

THIS nutritional study was conducted on sixty-two children between the ages of 5 and 15 years in the State Tuberculosis Sanatorium at Lakeville, Mass. Dental observations were made at four-month intervals over a twenty-seven months' period. The children were divided into two groups for study, but no attempt was made to separate them according to age or sex. The diet was balanced, with the standard adequate diet of Boyd and Drain as a basis. It was not strictly followed, however, during the entire course of the experiment. Lack of vegetables was especially common. Sugar in all forms was kept at a minimum.

One group of children received 8 ounces of tomato juice in addition to the regular diet for fifteen months. They developed an average of 0.298 cavities per child per four-month period. The other group of children received the same diet minus the tomato juice. They developed an average of 1.03 cavities per child for the same period. The regimen was then reversed. The incidence also changed. The first group which had a low incidence of caries when supplied with the tomato juice developed 0.97 cavities per child per four-month period. The other group developed 0.241 cavities with the supplement of 8 ounces of canned tomato juice daily. The low incidence of caries following the feeding of tomato juice is attributed to its high vitamin C content.—*Massachusetts D. Soc. Bull.*, 17:4, March 1941.

VIRGIL D. CHEYNE.

Present-Day Aspects of the Etiology of Cancer

By N. K. FORSTER

THE author states that all living cells are potential cancer cells and, once malignancy is invoked in a cell, all the future descendants of that cell will be similarly affected. Thus, the causative factor in the malignancy is no longer necessary for continued growth of the neoplasm. The author does not believe that cancer as such is inherited, but he does believe that the susceptibility of a certain group or groups of cells to cancer is inherited. It is the deduction, therefore, that cancer is dependent on a poorly balanced system the cells of which have a high cancer potentiality, which may become active under the influence of perverted physiologic processes. The mode of conversion of normal cells acting in a normal way to atypical unregulated cells is as yet unknown.

Morton's classification of predisposing factors in cancer is included in this article. It is as follows:

1. Physical
   - (a) Traumatic.
   - (b) Thermic (cold, heat).
   - (c) Actinic (ultraviolet; roentgen rays; radium).
2. Chemical
   - (a) Stasis.
   - (b) Simple chemicals.
   - (c) Coal tars.
   - (d) Internal secretions (estrogens; vitamins).
3. Biologic
   - (a) Bacteria
   - (b) Viruses
   - (c) Helminths

4. Combinations of 1, 2 and 3.—*J. Indiana M. A.*, 34:208, 1941.

CLAYTON LOWERY.

Incidence of Root Resorption of Vital Permanent Teeth

By SAMUEL HAMLEY

IN a study of 4,959 teeth submitted to orthodontic therapy, only 172 teeth (3.5 per cent) gave any evidence of root resorption. Of this group, only eight teeth (0.2 per cent) showed involvement of as much as one-third of the root, and no teeth suffered a loss of more than approximately one-third of the root. It is thus apparent that the incident of root resorption can be reduced to the extent that it need not be regarded as a hazard to orthodontic treatment.—*J. D. Res.*, 20:133, April 1941.

E. C. WOODS.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

AMERICAN ACADEMY OF PERIODONTOLOGY, Houston, Texas, October 23-25.

AMERICAN ASSOCIATION OF DENTAL EDITORS, Houston Texas, October 25.

AMERICAN ASSOCIATION OF PUBLIC HEALTH DENTISTS, Houston, Texas, October 26-28.

AMERICAN COLLEGE OF DENTISTS, Houston, Texas, October 26.

AMERICAN CONGRESS OF PHYSICAL THERAPY, Washington, D. C., September 1-5.

AMERICAN DENTAL ASSISTANTS ASSOCIATION, Houston, Texas, October 27-31.

AMERICAN DENTAL ASSOCIATION, Houston, Texas, October 27-31.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION, Houston, Texas, October 27-31.

AMERICAN OCCUPATIONAL THERAPY ASSOCIATION, Washington, D. C., September 1-5.

AMERICAN PUBLIC HEALTH ASSOCIATION, Atlantic City, N. J., October 14-17.

AMERICAN SOCIETY OF ORAL SURGEONS AND EXODONTISTS, Houston, Texas, October 23-25.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second and fourth Tuesdays in each month from October to June at the United States Public Health Service Auditorium, Washington.

LATIN AMERICAN CONGRESS FOR PLASTIC SURGERY, Rio de Janeiro and S. Paulo, July 6-12.

NATIONAL DENTAL ASSOCIATION, Richmond, Va., August 11-15.

GREATER NEW YORK DENTAL MEETING, December 1-5, New York.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA, Pittsburgh, November 11-13.

PACIFIC COAST DENTAL CONFERENCE, Portland, Ore., July 7-11.

SOUTHERN SOCIETY OF ORTHODONTISTS, Raleigh, N. C., September 29-30.

STATE SOCIETIES

July

Washington, at Portland

September

Southern California, at Los Angeles (8-10)
Hawaii, at Honolulu

November

Ohio, at Columbus

STATE BOARDS OF DENTAL EXAMINERS

Arizona, at Phoenix, July 9-12. R. K. Trueblood, 25 N. Second St., Glendale, Secretary.

Montana, at Helena, July 14. Leonard A. Jenkins, 401 Ford Bldg., Great Falls, Secretary.

North Dakota, at Fargo, July 7-10. L. I. Gilbert, 401 Black Bldg., Fargo, Secretary.

AMERICAN ACADEMY OF PERIODONTOLOGY

THE American Academy of Periodontology will hold its twenty-eighth annual meeting at the Lamar Hotel, Houston, Texas, October 23-25.

RAYMOND E. JOHNSON, *Secretary,*
824 Lowry Medical Arts Bldg.,
St. Paul, Minn.

AMERICAN ASSOCIATION OF DENTAL EDITORS

THE American Association of Dental Editors will hold its annual meeting in the Rice Hotel, Houston, Texas, October 25. An all day program has been arranged and editors are urged to attend.

O. W. BRANDHORST, *Secretary,*
4952 Maryland Ave.,
St. Louis, Mo.

AMERICAN CONGRESS OF PHYSICAL THERAPY

THE twentieth annual scientific and clinical session of the American Congress of Physical Therapy will be held September 1-5 at the Mayflower Hotel, Washington, D. C. The mornings will be devoted to the

annual instruction course and the afternoons and evenings to the scientific and clinical sessions. The seminar and convention proper will be open to all physicians and qualified technicians. For information concerning the seminar and preliminary program of the convention proper, address the American Congress of Physical Therapy, 30 North Michigan Ave., Chicago, Ill.

AMERICAN ASSOCIATION OF PUBLIC HEALTH DENTISTS

THE annual meeting of the American Association of Public Health Dentists will be held in the Lamar Hotel, Houston, Texas, October 26-28.

FRANK C. CADY, *Secretary,*
U. S. P. H. S. Hospital,
Lexington, Ky.

AMERICAN COLLEGE OF DENTISTS

THE Houston convocation of the American College of Dentists will be held in the Rice Hotel, October 26, with morning, luncheon, afternoon and evening sessions.

O. W. BRANDHORST, *Secretary,*
4952 Maryland Ave.,
St. Louis, Mo.

AMERICAN DENTAL ASSISTANTS ASSOCIATION

THE seventeenth annual session of the American Dental Assistants Association will be held in Houston, Texas, October 27-31. For further information, address

AILEEN M. FERGUSON,
General Secretary,
709 Centre St.,
Jamaica Plain, Mass.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION

THE eighteenth annual meeting of the American Dental Hygienists' Association will be held in Houston, Texas, October 27-31. Headquarters, Lamar Hotel.

A. REBEKAH FISK, *Secretary,*
General Dispensary, U. S. Army,
Washington, D. C.

AMERICAN OCCUPATIONAL THERAPY ASSOCIATION

THE twenty-fifth annual meeting of the American Occupational Therapy Association will be held at the Mayflower Hotel, Washington, D. C., September 1-5. A combined meeting of the association with the American Congress of Physical Therapy will be held September 3. For further information, address

(MRS.) META R. COBB,
175 Fifth Ave.
New York, N. Y.

AMERICAN PUBLIC HEALTH ASSOCIATION

THE seventieth annual meeting of the American Public Health Association will be held in Atlantic City, N. J., October 14-17. Headquarters, Convention Hall; residence headquarters, Hotel Traymore. Ira V. Hiscock, professor of public health at the Yale School of Medicine, will speak at the luncheon session of the oral health group. Subject: "How Important Is the Dental Health Program? Nationally? Locally?"

WILLIMINA RAYNE WALSH,
Associate Secretary,
1790 Broadway,
New York, N. Y.

AMERICAN SOCIETY OF ORAL SURGEONS AND EXODONTISTS

THE twenty-second annual meeting of the American Society of Oral Surgeons and Exodontists will be held in Houston, Texas, October 23-25, with headquarters at the Texas State Hotel.

HARRY BEAR, *Secretary,*
410 Professional Bldg.
Richmond, Va.

INTERNATIONAL COLLEGE OF DENTISTS

THE United States Section of the International College of Dentists is sponsoring a movement to aid the dentists of Great Britain and China by providing them with badly needed supplies, instruments and small equipment used in the practice of dentistry. These will be collected and sent abroad by the Medical and Surgical Relief Committee of America. Any member of the dental profession or dental trade who can aid in this movement by contributions of such material is asked to communicate with Mrs. Rodgers Balcom, executive chairman of the Medical and Surgical Relief Committee of America, 420 Lexington Ave., New York, N. Y.

ELMER S. BEST, *Registrar,*
Medical Arts Bldg.,
Minneapolis, Minn.

LATIN AMERICAN CONGRESS FOR PLASTIC SURGERY

THE first Latin American Congress for Plastic Surgery will be held in Rio de Janeiro and S. Paulo, July 6-12.

ANTONIO PRUDENTE, *Chairman,*
Sao Paulo,
Brazil.

NATIONAL DENTAL ASSOCIATION

THE National Dental Association will convene for the twenty-eighth annual session August 11-15, in Richmond, Va. For further information, address

J. A. JACKSON, *Secretary,*
Charlottesville, Va.

GREATER NEW YORK DENTAL MEETING

THE Greater New York Dental Meeting will be held December 1-5 at the Hotel Pennsylvania, New York.

WALTER A. QUINN, *Chairman,*
Press & Publication,
Room 106A,
Hotel Pennsylvania,
New York.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA

THE annual meeting of the Odontological Society of Western Pennsylvania will be held November 11-13 at the William Penn Hotel, Pittsburgh.

W. EARLE CRAIG, *Secretary,*
206 Jenkins Bldg.,
Pittsburgh.

PACIFIC COAST DENTAL CONFERENCE

THE sixth triennial Pacific Coast Dental Conference will be held in Portland, Ore., July 7-11.

A. F. WEEKS, *Secretary,*
Selling Bldg.,
Portland, Ore.

SOUTHERN SOCIETY OF ORTHODONTISTS

THE next meeting of the Southern Society of Orthodontists will be held in Raleigh, N. C., September 29-30.

T. C. SPARKS, *Secretary,*
Medical Arts Bldg.,
Columbia, S. C.

SOUTHERN CALIFORNIA STATE DENTAL ASSOCIATION

THE next annual meeting of the Southern California State Dental Association will be held September 8-10 at the Los Angeles Biltmore Hotel.

FRANCIS J. CONLEY, *Secretary,*
804 Professional Bldg.,
Los Angeles.

ARIZONA STATE DENTAL BOARD

THE Arizona State Board of Dental Examiners will hold its annual examination of applicants for license to practice dentistry in Arizona at Phoenix, July 9-12. All application blanks and fees must be in the hands of the secretary at least fifteen days prior to the date of the examination. For application blanks and other information, address

R. K. TRUEBLOOD, *Secretary,*
25 N. Second Ave.,
Glendale.

MONTANA STATE BOARD OF DENTAL EXAMINERS

THE regular annual meeting of the Montana State Board of Dental Examiners for the examination of applicants desiring to practice dentistry or dental hygiene will be held in Helena commencing July 14. Montana does not reciprocate with any of the other states or the territories. All applicants must be citizens of the United States and must have received a degree from a dental school in the United States offering a full four year course.

LEONARD A. JENKIN, *Secretary,*
401 Ford Bldg.,
Great Falls.

NORTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

THE North Dakota State Board of Dental Examiners will hold its next examination in the Gardner Hotel, Fargo, July 7-10. For information and application, address

L. I. GILBERT, *Secretary,*
401 Black Bldg.,
Fargo.

BRONX HOSPITAL VOLUNTEERSHIPS

THE Dental Department of the Bronx Hospital offers a number of volunteerships to recent graduates in dentistry in the following branches: oral surgery and anesthesia; surgical pyorrhea; orthodontia; root

canal therapy, and operative dentistry. Those offering satisfactory credentials indicating their interest in the clinical study of dental surgery as a health problem will receive consideration. Address applications to the Dental Department, Bronx Hospital, Fulton Ave. at 169th St., Bronx, New York. Appointments will begin in July.

DAVID WURZEL, *Director,*
Dental Department.

DENTAL INTERNSHIP

THE Utah State Hospital, Provo, wishes to procure a dental intern, preferably a resident of Utah graduating this spring. The internship is for a year or more of full-time service. For particulars, address

GARLAND H. PAGE, *Superintendent,*
Utah State Hospital,
Provo.

EXAMINATION FOR APPOINTMENT IN THE DENTAL CORPS OF THE NAVY

A COMPETITIVE examination to select candidates for appointment in the Dental Corps of the Navy will be held July 7 at the Naval Medical School, Washington, D. C., the Naval Training Station, Great Lakes, Ill., and the Naval Training Station, San Diego, Calif. A candidate for appointment in the Dental Corps must be a citizen of the United States, between 21 and 32 years of age at the time of appointment, and a graduate of a standard dental college. A circular which contains full information relative to the Dental Corps and describes the method of making application for appointment can be obtained from the Bureau of Medicine and Surgery, Navy Department, Washington, D. C.

CARNEGIE FELLOWSHIPS FOR RESEARCH AND GRADUATE WORK IN THE DENTAL SCIENCES

AIDED by the Carnegie Corporation, the School of Medicine and Dentistry of the University of Rochester offers scholarships paying $1,200-$1,800 per annum to well-trained dental graduates who are interested in research or who desire special training in the basic medical sciences as an aid to dental teaching or practice. A few fellowships also offer part-time training in oral surgery. On appointment, the applicant is given the title of Carnegie Dental Fellow and, according to his interest, works as a graduate student in one of the departments of the medical schools. Here, excellent laboratory facilities, adequate direction and close contact with various investigations related to medicine and dentistry help his research and study. Fellows are encouraged to attend medical classes, seminars and staff meetings and, when opportunity presents itself, to participate in class instruction and scientific meetings. Contact with the problems of clinical dentistry may be maintained through the Oral Surgery Clinic of the Strong Memorial Hospital and the Rochester Dental Dispensary. With the approval of the Graduate Council of the university, Fellows may prepare themselves for the degree of M.S. or Ph.D. Application should be made to

GEORGE H. WHIPPLE, *Dean,*
School of Medicine and Dentistry,
University of Rochester,
Rochester, N. Y.

RESIDENCY IN DENTAL MEDICINE

THE University of Oregon Medical School Hospitals and Clinics offer a residency in the Division of Dental Medicine and Oral Surgery. Appointment will be made about the first of December. The period of service is for one year, July 1 to June 30. Compensation is $40 a month in addition to board, room and laundry. The division is under the general direction of the Department of Medicine. Its service is carried on in several units: 1. The General Outpatient Clinic. 2. The Multnomah Hospital. 3. The Doernbecher Children's Hospital. 4. The University State Tuberculosis Hospital. Service is under the direct supervision of the head of the division and a visiting staff of sixteen dentists. Application blanks will be furnished on request to

RICHARD B. DILLEHUNT, *Dean,*
University of Oregon Medical School,
Portland.

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING APRIL AND MAY 1941

April 1

No. 2,236,627, EARL J. MCWHIRTER. Toothbrush and head.

No. 2,236,828, FRED W. MUNCIE. Dental cream.

April 8

No. 2,237,350, HEINRICH HOLLMANN. Production of artificial teeth.

No. 2,237,694, BENJAMIN ALTSTADT. Toothbrush.

No. 2,237,926, RALPH C. COOLEY. Dental pattern.

April 15

No. 2,238,323, JULIAN R. HOLLINGSWORTH. Device for facilitating the administration of subcutaneous hypodermic injections.

No. 2,238,440, NATHANIEL CHAYES. Portable hand tool electric motor driven grinder.

No. 2,238,551, VICTOR BLOOM and BENJAMIN SIEGEL. Dental articulator with offset pivotal connection for the holders.

No. 2,238,582, CLOYD C. DICKINSON and CLAYTON F. B. STOWELL. Hypodermic injection apparatus and method of preparing for and making such injections.

April 22

No. Re.21,779, JOSEPH H. SCHLESINGER. Neutralization of acids exuding from silicious cements.

No. 2,239,294, NATHAN OPOTOW. Dental apparatus.

No. 2,239,392, NATHAN D. LEVICK. Dental accessory device.

No. 2,239,659, JAMES B. POINDEXTER. Dental x-ray film holder.

April 29

No. 2,239,835, HENRY ZIMMERMAN. Dental articulator.

No. 2,239,845, FRANCIS J. GIBBONS and JOHN J. GIBBONS. Attachment for dental handpieces.

No. 2,239,960, WALTER C. HARBART. Dentist's plastic tray.

No. 2,240,336, RAYMOND L. KREIDER. Dental x-ray film holder.

May 6

No. 2,240,876, ALFRED WATERUD. Denture brush and dispenser.

No. D-127,080, ROBERT C. ANGELL. Design for a folding dental chair.

May 13

No. 2,241,464, SAMPSON D. KOCH. Electric motor driven toothbrush.

No. 2,241,584, MAXIMILIAN COHEN. Toothbrush and dental mirror.

No. 2,241,875, CARL DAME CLARKE. Composition.

May 20

No. 2,242,720, GEORGE E. FROELICH. Professional cabinet.

No. 2,242,743, DONOVAN W. BROWN. Toothbrush.

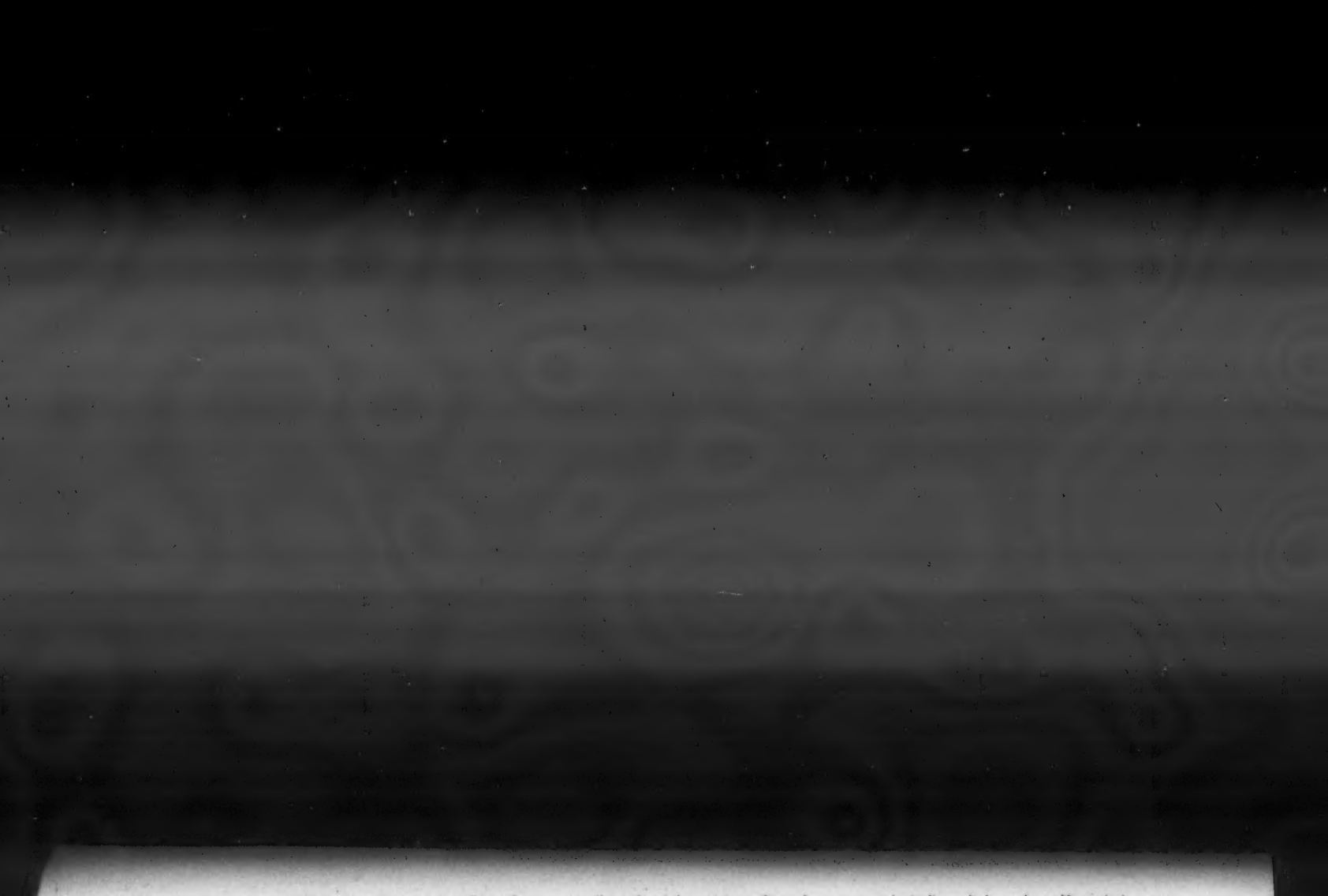
May 27

No. 2,243,094, CORNELL JOEL GROSSMAN. Refractory dental mold for casting alloys.

No. 2,243,377, LUDWIG HALLER. Set of false teeth.

No. 2,243,445, CHARLES E. SUMMY. Combination expansible absorbent receptacle for investments.

No. 2,243,583, MICHAEL RUSSELL STEIN. Display mount for artificial teeth.

No. 2,243,774, VICTOR J. RESH. Dispensing device.

No. D-127,463, HERMAN RICHARD NERBAS. Design for a reversible dental retractor.